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Table of Contents

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ORIGINAL ARTICLES— PAGE.

"Human and Murine Leprosy in Tropical Australia: Preliminary Notes and Observations," by R. W. CILENTO, M.D., B.S., D.T.M. & H., and E. A. NORTH, M.B., B.S. .. 767

"Plants, Including Fungi, Poisonous or Otherwise Injurious to Man in Australia," Series III, by J. BURTON CLELAND, M.D. .. 775

"Some Observations on the Bendien Test for Cancer," by MAVIS FREEMAN, B.Sc., H. F. HOLDEN, M.A., M.Sc., W. W. LEMPRIERE, M.B., B.S., R. KAYE SCOTT, M.D., F. E. WILLIAMS, and C. H. KELLAWAY, M.C., M.D., M.S., F.R.C.P. .. 778

"Bedside Blood Sugar Estimation: A New Clinical Method," by BRUCE HUNT, M.D., M.R.C.P. .. 782

REPORTS OF CASES—

"Hydronephrosis Due to an Abnormal Vein," by S. S. GARDINER, M.B., Ch.M. .. 783

REVIEWS—

Structure of the Central Nervous System .. 785
The History of Anatomy .. 786
Bacteriology .. 786
Psychiatry for Nurses .. 786

LEADING ARTICLES—

Death of Dr. Robert Henry Todd .. 787
"Hysterosalpingography" .. 787

CURRENT COMMENT—

Nephritis and Œdema .. 788
A Christmas Appeal .. 789

ABSTRACTS FROM CURRENT MEDICAL LITERATURE— PAGE.

Morbid Anatomy .. 790
Morphology .. 791

BRITISH MEDICAL ASSOCIATION NEWS—

Medico-Political .. 792
Nominations and Elections .. 793

RESEARCH—

Anthropological Expedition to Central Australia 793

CONGRESS NOTES—

The Australasian Medical Congress (British Medical Association) .. 797

PROCEEDINGS OF THE AUSTRALIAN MEDICAL BOARDS—

Queensland .. 797

OBITUARY—

James Kaye Troup .. 797

PUBLIC HEALTH—

Poliomyelitis in New South Wales .. 797
Poliomyelitis Committee of Victoria .. 797

BOOKS RECEIVED .. 798

MEDICAL APPOINTMENTS .. 798

MEDICAL APPOINTMENTS VACANT, ETC. .. 798

MEDICAL APPOINTMENTS: IMPORTANT NOTICE 798

EDITORIAL NOTICES .. 798

HUMAN AND MURINE LEPROSY IN TROPICAL AUSTRALIA: PRELIMINARY NOTES AND OBSERVATIONS.

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THE first record of examination for rat leprosy in the tropical part of Australia was made by Priestley, of the Australian Institute of Tropical Medicine, Townsville, in 1913, when the disease was found present in 12 out of 220 rats examined, six suffering with the disease in its cutaneous form and six in which it was confined to the lymph glands. All the specimens were *Rattus norvegicus*.

Following the outbreak of plague in 1922, very considerable numbers of rats were presented for examination as a routine measure at the Institute at Townsville and at the Commonwealth Health Laboratory at Rockhampton. J. Fielding, in 1927, examined 930 rats (*Rattus norvegicus*), of which eleven were infected, six with skin involvement and five in the lymph glands only. Of a considerably larger number of other rats (*Rattus rattus* and *Rattus alexandrinus*), not one was found infected. In Rockhampton, R. E. Richards described his results in July, 1927. Of 11,935 rats, 0·6% were found infected, all being *Rattus norvegicus*, and the two forms of the disease were again found about equally represented. The infected rats were fairly evenly distributed throughout the city areas, and from two of the houses from which they had been taken, two cases of human leprosy had been reported some years previously.[1]

The similarity of the symptoms and of the causative organism to those found in human leprosy

[1] Dr. R. J. Bull recorded the first leprous rat found in Victoria in 1907 and states that one infected rat was found out of more than 200,000 examined in New South Wales.

had frequently aroused speculation as to a possible relationship. The work done in this regard was not overlooked, but since Australia, with its small and localized leper problems, offers a particularly favourable field for investigation, the coincidence that rat leprosy had been found most prevalent precisely in those localities where human leprosy exists in North Queensland, was of sufficient interest to indicate the desirability of investigation.

Over a period of twenty-seven months (March 17, 1929 to June 13, 1931) 7,504 rats have been caught in Rockhampton and examined by the Medical Officer in Charge at the Commonwealth Health Laboratory there, for evidence of this disease. Of this number, 16, all belonging to the species *Rattus norvegicus*, have been found infected, being 0·21% of the total rats caught and 0·35% of the *Rattus norvegicus* species amongst them. Of the 16 infected rats, nine were males and seven females, and 14 were caught between June and December, 1930, over an area of about one mile square in the business portion of the city. This seasonal distribution, while perhaps accidental, is possibly a matter of epidemiological interest.

RAT LEPROSY.

From an examination of the literature at the Australian Institute of Tropical Medicine, Townsville, Dr. G. M. Heydon, then Acting Director, forwarded a summary of the information obtainable upon the subject, from which the following points are extracted.

Rat leprosy is of wide distribution throughout the world, and very different infection rates have been found in different places, not fully explicable by variations in the thoroughness or skill of examination. Stefansky, the discoverer of the disease, found 4% to 5% of the brown rats of Odessa infected, infection of the lymph glands being twice as common as skin infection. All observers agree that the natural disease is almost confined to *Rattus norvegicus*, though in rare instances *Rattus rattus* and *Rattus alexandrinus* have been found naturally infected. It is claimed that other rats, including white laboratory rats, may be artificially infected, and so may white mice. In the type of infection confined to the lymph glands, those most commonly involved are the glands of the axilla, groin, neck and submaxillary region; and the condition may vary from involvement of a single node to gross dissemination through these regions. The glands affected are usually large and hard, but occasionally no change is apparent without microscopical examination. The internal organs and all other tissues are unaffected. On section of the glands, no nodules or necrotic areas are visible, but on microscopical examination the cells of endothelial type, which are in large numbers, are seen to be stuffed with bacilli, as are also the giant cells which are present.

In the form involving the skin, and often the subjacent striated muscles, patches of alopecia are the feature most immediately obvious. They may be small or extensive, and skin bosses often nodulate their surfaces. Ulceration is not uncommon in areas liable to injury and abrasion. On incision the area is found greatly thickened owing to the presence of a pale yellowish infiltration of the dermis; subcutaneous fat is absent; and the epidermis is comparatively little involved, though bacilli may be present in its cells. On microscopical examination, enormous masses of bacilli are found within the cells, which are round, flat or polygonal in shape, with a large nucleus and abundant protoplasm. The whole condition bears a close similarity to that of nodular leprosy in man, but a difference exists in the fact that the bacilli in the cells are not arranged in the bundles characteristic of Hansen's organism, but are disposed irregularly. The striated muscle, such as that of the abdominal wall, may be involved by extension, and the muscle fibres invaded by the bacilli degenerate, lose their striation, and finally may be replaced, with the exception of the nuclei, by densely packed masses of bacilli. Marchoux, however, is of the opinion that the muscle cells themselves are not invaded, but that they atrophy as the invasion of the interfascicular connective tissue proceeds. Visceral lesions are exceptional and occur only in advanced cases, while severely infected animals are often emaciated and move with difficulty.

In respect of transmission, rat leprosy can readily be passed experimentally to healthy animals of the same species, and also to the laboratory white rat. This was first done by Dean, though the earliest workers (Stefansky and Rabinowitsch) failed in their transmission experiments. The fact that rat leprosy is transmissible and that human leprosy cannot be readily (if at all) transmitted to laboratory animals has led to prolonged research in the former disease in the hope of throwing light upon the disease in man.

In the experiments of Marchoux and others it is stated that intraperitoneal injections of infected material give rise to a form of the disease unlike that naturally occurring, but that when subcutaneous injection is performed, or infected material is rubbed on a scarified area of the skin in a healthy rat or merely on a spot from which the hairs have been pulled out, the "lymph node" type of infection almost invariably results after a period of from four to six or even twelve months. At this stage, as in the natural disease, the skin is often quite healthy and no indication may exist of the site of entry. In course of time other lymph glands may become involved, and eventually, in some rats, but not in all, some portion of the skin becomes involved and the musculo-cutaneous form of the disease established. According to Marchoux and Sorel, the involvement of the skin is facilitated by secondary organisms. Infection by contact from rats with the skin type was obtained by Currie. The most thorough investigation on modes of transmission have been those of Marchoux. He investigated the various invertebrate vectors which have often been suggested in rat, as in human, leprosy, and decided against fleas, lice, sarcoptes, demodex and lælaps. The relation of the bacillus of rat leprosy to that of man has been compared with that of avian to human tuberculosis. All attempts to produce definite leprosy transmissible to further animals, in rodents by the inoculation of human material, have so far failed, though certain lesions have been produced in Japanese waltzing mice and in monkeys. In 1929 de Souza-Araujo, in Brazil, recorded the transmission of human leprosy to the white mouse. Probably judgement should be suspended as to whether the disease produced was any better defined or more transmissible than in the older experiments.

Cecil Cook, considering only the Australian evidence, marshals in a striking fashion the evidence that might be held to support the transmission of leprosy from rats to man by means of the flea *Xenopsylla cheopis*. He decided on the whole against the theory, since leprosy in Australia, he contends, after introduction by the Chinese, spread first among the aborigines, including the "myalls" (wild blacks) and that in the camps of these rats are absent.

Marchoux insists that in man, as in rats, the majority of the infections may be confined to the lymph glands and may progress no further. He considers that such cases are usually missed, and search instigated by him by gland puncture among the contacts of lepers resulted in the discovery of a few such cases.

As in the case of Hansen's organism, there is no general agreement that the bacilli of rat leprosy have been cultured *in vitro*. Many of those who have worked most on the subject, consider that neither Hansen's bacillus nor that of rat leprosy has yet been cultivated. Little importance is attached by many workers to the immunological and complement deviation work which has been done with leprous bacilli either of man or of the rat, and

with organisms cultured from lesions. Such reactions with acid-fast bacilli, with present technique, are held to possess limited significance. Iwanow, at the suggestion of Metchnikoff, and before the discovery of rat leprosy, investigated the fate of Hansen's bacilli injected into guinea-pigs intraperitoneally, and was able to find them after eight months in large numbers in the abdomen. He thought that possibly some multiplication had occurred, and found a few bacilli in the spleen, liver, kidneys and bone marrow. With subcutaneous inoculation the bacilli were later found in the lymph glands and a few in the viscera. Bayon, in 1911, described direct transmission of leprosy from man to rats and rabbits, also the culture of human lepra bacilli in the form of a streptothrix (also appearing as diphtheroids), which would cause leprosy in laboratory animals. He considered also that he had cultured rat leprosy bacilli, and believed his organisms to be the same as those obtained by Kedrowsky in 1901. His conclusions were disputed by Marchoux among others. In 1923 Marchoux stated that Hansen's bacillus and Stefansky's bacillus had never been cultured in series and that human leprosy has not been transmitted with complete success to any animals. He discussed the close similarity of rat and human leprosy in pathogenesis, morbid features, pathological anatomy and course, and stated that the rat disease is easily transmissible to white rats and even mice. From his observations he has arrived at the conclusions, *inter alia*, that: (i) Heredity is not concerned in transmission, as the litters of leprous mothers did not become leprous. (ii) Lice, fleas, lælaps and sarcoptes do not transmit the disease, even when transferred in great numbers from infected to healthy animals, though the bacilli are often present in their gut. Flies are capable of transmitting by inoculating a wound in a healthy animal with bacilli carried on their feet from a leprous ulcer, but the transfer must be made quickly, since the bacilli are killed by drying (twenty-four hours the limit). Experimentally, coitus has failed to transmit the infection.

More recently, and since the cultural experiments with material from leprous rats were commenced at Rockhampton, as described below, it was noticed that Shiga had reported the culture of the bacillus of human leprosy on potato medium previously boiled in 4% glycerine-bouillon, after treatment of the material with sulphuric acid. Since then it is reported that several other investigators following up his work have isolated acid-alcohol-fast bacilli from lesions of human leprosy.

EXPERIMENTAL WORK AT ROCKHAMPTON: STAGE I.

As a preliminary, in continuation of the investigation made previously by Dr. R. E. Richards, one of the authors, who is Medical Officer in Charge, Commonwealth Health Laboratory, Rockhampton, closely investigated the circumstances attending the location of leper patients found in Rockhampton, and of infected rats.

The result of this inquiry was disappointing, in spite of the cooperation of the State Department of Public Health and local authorities. Cases being relatively few, and dating back in some instances a number of years, sources of information had frequently disappeared. The information, incomplete as it is, is included in Table I. In no case, except that of number 6, was a leper living in the same house as he was when detected. This particular house was well constructed, clean and airy, and in a good, though rather low-lying locality. It was a new house when the leper entered it. Of the remainder, some houses had been demolished and others reconstructed, but it was obvious in all observed that they had been originally poorly built, low-lying, badly ventilated places, uniformly in marked contrast to the majority of Rockhampton dwellings, most of which are built on high blocks and are more or less immune from rat infestation of a serious nature. In Table II the nineteen cases studied have been subdivided into six different classes in respect of the possibility of infected rats being an ætiological factor in the occurrence of their disease. The following will be observed:

1. In four cases—numbers 3, 4, 11 and 16—there is insufficient or no data, although in case number 16 it is probable that the patient lived in a locality from which infected rats have been reported. It is also likely that he was exposed to infection, either from other lepers or from infected furniture, dwelling *et cetera*. Further, it is not known if he contracted leprosy before or whilst living there.

2. In the next group there is only one case—number 2. This is of no value, because the length of residence in the locality is unknown.

3. Thirdly, there were those cases in which an exposure to previous lepers is known or strongly suspected and near whose residences infected rats have been reported. There is strong evidence that all these lepers, except number 10, had contracted the disease from other lepers. Number 10 had signs for so long before detection (twelve years) that it is impossible, if he did not contract it from his father, as is suggested, to say how he acquired the infection.

4. Those giving no history of exposure to lepers or infected rats comprise two cases, numbers 6 and 14. In case number 6 there is a suggestion of exposure to another leper, but if the leprosy were acquired whilst the patient was living at his present address, it is most unlikely that infected rats could be implicated. Case number 14 speaks for itself.

5. In a fifth group is case number 1. It was impossible to obtain any further information about this patient except that contained in the Commonwealth Department of Health's Service Publication number 38, page 143.

6. Lastly, there are those cases, numbering five—numbers 7, 8, 12, 15 and 18—in which an exposure to previous lepers has been shown, but in which no infected rats have been reported in the locality. These infections, and especially that of number 12, whose father was a leper, and that of number 15, whose brother, number 18, contracted the disease years previously, point to former lepers being the source of contagion.

No convincing evidence, therefore, was forthcoming that there was in any case a connexion between a human leprosy infection and previous rat leprosy, though at first sight a connexion might be suggested.

Cultural Experiments.

As a further stage of the investigation it was decided to attempt cultural and transmission experi-

TABLE I.

Case Reference Number.	Year.	Name and Age.	Occupation.	Country of Origin.	Years in Australia.	Years in District.	Date of first sign.	Locality at onset.	Duration at detection.	Locality of residence in Rockhampton.	Infected rats recorded in same locality.	Remarks.
1.	1911	N.H. 19	Invalid.	Queensland.	Life.	Life.	1904	Rockhampton.	7 yrs.	—	—	Neighbour of G.N. (p. 142) and in earlier years lived close to J.H. (p. 140) and H.C.C. (p. 143).
2.	1908	F.C.M. 58	Boarding house keeper.	New South Wales	Life.	Many.	1906	Rockhampton	2 yrs.	Block 38.	1 in 1926 in same Block.	Leprosy possibly of 8 years' duration in 1908.
3.	—	C.W.	—	—	—	—	—	—	—	—	—	—
4.	—	H.C.	—	—	—	—	—	—	—	—	—	—
5.	1915	F.H. 44	Labourer.	Queensland.	Life.	Life?	1900	Rockhampton.	12 yrs.	Block 86 Gladstone Road; formerly Block 80.	2 in Block 80 since 1925.	Brother-in-law of Number 13. Evidence of exposure to J.Q. (p. 139) and J.H. (p. 140) in 1890. Known to have lived in Block 80 (cnr. East and Stanley Streets) about 1901 and for many years previously. It is probable he contracted disease whilst living here.
6.	1926	J.H.R. 32	Railway fireman.	Queensland.	Life.	23	1922	North Rockhampton.	4 yrs.	North Rockhampton 8 years. Block 21 7 years previously.	Nil.	Unable to trace any evidence of exposure definitely. However, up till about 11 years before detection he worked as a cabinet maker for a man who he thought had lesions on his leg identical with those on his own leg later. The man for whom he worked has since died. R.'s house in North Rockhampton is in good order, on high blocks, and quite new when he occupied it.
7.	1917	P.M. 35	Wharf labourer.	Queensland.	Life.	Life.	1917	Rockhampton.	—	Block 150B.	Nil.	May have been infected at Duaringa. Exposure to Number 5 and Number 10 casual.
8.	1917	F.C. 49	Carpenter.	Queensland.	Life.	Life.	1916	Clermont.	1 yr.	Block 144 within 1 year of detection.	Nil.	Residing at Epton Forest near Clermont for 5 months before detection. Previously lived in Rockhampton, Block 144, but for 3 months only. House on low blocks and rat infested. Previously lived in North Rockhampton all his life and never saw rats near his house. Was a friend of Number 10 for years but never in his house. Knew Number 5 very slightly and denies ever having seen G.N. (p. 142) to whom exposure is noted (p. 144).
9.	1919	W.K. 11	School boy.	Queensland.	Life.	Life except visit Longreach.	1918	Rockhampton?	15 ms.	Block 104.	3 in Block 104 since 1925.	Lived in an endemic area in lower East Street (Block 104) two doors away from J.L. who is said to have had leprosy and committed suicide in 1917. Evidence of exposure also to Number 10 who lived in next block (Block 79).
10.	1914	A.P. 42	Clerk.	England.	Since infancy.	Life.	1903?	Rockhampton.	12 yrs.	Block 79 for about five years in 2 different houses. Block 16 five years previously. Before that for many years Block 49.	4 in Block 79 since 1925 including 2 in house he lived in. Nil in Block 16. 1 in Block 49 since 1925 but some distance away lane intervening.	Symptoms date back to time that he lived in boarding house in Block 49 where he was for many years. This information was supplied by a sister of his. Father suffered from a condition suggestive of *leprosis nervorum*. No other contact traced.
11.	1920	A.W.	—	—	—	—	—	—	—	—	—	Insane. This patient informed a former patient at Peel Island during an apparently lucid interval that she lived at Thompson's Point, which is some miles down the Fitzroy River from Rockhampton.
12.	1922	R.G.S. 15	School boy.	Queensland.	Life.	5 years.	1921	Rockhampton.	1 yr.	Block 92: a few months in Block 90.	Nil.	Born and lived earlier years at Clermont and latterly lived with father in Rockhampton and various other places prior to his (the father's) death in 1917 at Gympie (p. 145). Father had leprosy probably contracted at Cooktown many years before (p. 193). An aunt also a leper.

(NOTE: The page references refer to Commonwealth of Australia, Department of Health, Service Publication No. 38.)

TABLE I.—*continued.*

Case Reference Number.	Year.	Name and Age.	Occupation.	Country of Origin.	Years in Australia.	Years in District.	Date of first sign.	Locality at onset.	Duration at detection.	Locality of residence in Rockhampton.	Infected rats recorded in same locality.	Remarks.
13.	1922	G.W. 59	Wharf labourer.	Queensland.	Life.	Life.	1922	Rockhampton.	6 mns.	Block 41 few mths. prior to detection Block 49 for years previously.	2 in Block 41 since 1925. 1 in Block 49 but at furthest away point across lane. 2 in Block 50 across street.	Brother-in-law of Number 5. Evidence of exposure to Number 10 (who was a tally clerk at wharf for some considerable time) and to Number 7. G.W. has now returned to Rockhampton and is working on wharf. Is of intemperate habits and quite illiterate. He lives now in an endemic area in lower East Street in poor low-lying house. Wife states that lesions are more marked now than when sent to Peel Island. The wife, whose brother, F.H. (Number 5), is a leper, looks suspiciously like one herself.
14.	1923	M.J.B. 39	Domestic.	Queensland.	Life.	Life.	1921	Rockhampton.	2 yrs.	In neighbourhood of Block 21, later in Canning St't and Dawson Road.	Nil in immediate neighbourhood	Onset shortly after arrival from Maryborough, Burnett and Mary Valley.
15.	1924	T.A.P. 35	Domestic.	Queensland.	Life.	Life.	1921	Rockhampton.	3 yrs.	Block 114.	Nil.	Sister of H.C.C., a leper detected in 1913. When children J.H. (p. 140) delivered letters at house and a sister (Mrs. T.) thinks he visited the house socially. Patient was living under very poor circumstances when leprosy detected and had noticed discoloration of arm for years.
16.	—	F.I.C.	—	—	—	—	—	—	—	—	—	No other information apart from that from Brisbane to effect that he lived in Lower East Street and later at Innisfail, where the case was detected.
17.	1926	A.C. 37	Railway shunter.	Queensland.	Life.	Life except when at Longreach.	—	Alpha or Mackay.	Unk'n	Block 104.	3 since 1925 but on other side of lane.	Relieving at different places for two years before detection. Previously to that lived in Longreach for perhaps two years or more. Wife's uncle, A.H., lived at Longreach. C.'s sister stated that he has been a leper at Peel Island since and now lives at Yarwun. C. lived in Rockhampton in house formerly occupied by J.L. who committed suicide in 1917.
18.	1913	H.C.C. 29	Railway pumper.	Queensland.	Life.	—	1911	Rockhampton.	2 yrs.	Block 119 about 2 years. Block 124 previously.	Nil.	At Bororen 8 years before onset was associated with a leper and previously associated with J.H. (p. 140).
19.	1914	W.B. 33	Dealer.	England.	—	—	1909	Rockhampton.	5 yrs.	Block 64.	1 in same Block and several in warehouse across street since 1925.	Detected and isolated Sydney, N.S.W. Associate of J.L. who committed suicide in 1917 and of Number 5. Father-in-law popularly believed to be leper (p. 143) but we understand this has not been confirmed.

(NOTE: The page references refer to Commonwealth of Australia, Department of Health, Service Publication No. 38.)

ments from rats found infected in nature, and to record the results, partly to confirm the work of others and partly to have on hand an adequate supply of leprous rat material for other investigations that suggested themselves in the event of success.

The Medical Officer in Charge, Commonwealth Health Laboratory, Rockhampton, was instructed to take advantage of any opportunity for this work that might occur. Accordingly, on June 16, 1930, several nodules were excised from a large female *Rattus norvegicus* with extensive lesions of rat leprosy, caught in the town. The material was ground up with glass beads in a mortar and normal saline solution was added until the whole was of a liquid nature. Smears made showed this emulsion to be full of acid-alcohol-fast bacilli.

Forty young male white rats, 70 to 100 grammes in weight, were then taken and divided into four batches. To each of the ten rats in the first batch one cubic centimetre of the emulsion was given intraperitoneally. To each of the second batch one cubic centimetre was given subcutaneously. In the rats of the third batch a small area of skin was slightly scarified after depilation and a drop of the emulsion was rubbed in. The fourth batch was similarly dealt with, but, in addition, a suspension of living staphylococci was also applied, as, accord-

TABLE II.

Not sufficient data.	Those giving no history of exposure to previous lepers, but where infected rats have been reported in same locality.	Those exposed to previous lepers and where infected rats have been reported in same locality.	Those giving no history of exposure to previous lepers and where no infected rats have been reported in same locality.	Those exposed to previous lepers but no data concerning infected rats.	Those giving history of exposure to previous lepers but where no infected rats have been reported in same locality.	Total on which conclusions could be based possibly.
No. 3	No. 2	No. 5	No. 6	No. 1	No. 7	
„ 4		„ 9	„ 14		„ 8	
„ 11		„ 10			„ 12	
„ 16		„ 13			„ 15	
		„ 17			„ 18	
		„ 19				
4	1	6	2	1	5	15

ing to Marchoux and Sorel, the involvement of the skin is facilitated by secondary organisms.

None of the rats appeared to suffer any immediate ill effects as a result of the inoculation, and within a few weeks the depilated areas on the rats of the third and fourth batches could not be distinguished.

Two and a half months from the time of inoculation a rat of the first batch died, and an examination did not reveal the cause of death. The peritoneal cavity looked normal, but a smear from the spleen showed acid-alcohol-fast bacilli, although macroscopically it looked normal, with the exception of a few minute white spots on the surface. No other sign of disease was noticed.

Within the next few weeks the remaining rats of this batch began to become emaciated and distinctly cannibalistic in habit, two animals being eaten entirely by their cage mates within a week.

One of the remaining rats, examined five months after inoculation, showed great enlargement of the spleen, the surface being studded with pale raised spots as large as a pin's head. The liver was involved, but to a less extent, and the greater portion of what remained of the peritoneal cavity was taken up with an enormously thickened mesentery. The spleen and mesentery were crowded with the bacilli, which were also found in the left kidney (which was hydronephrotic) and the liver. Although the distal part of the tail was necrosed and there were sores on the ears and snout, no bacilli were found in these lesions. The lymph glands in the neck, axilla and groin were not noticeably enlarged, but contained bacilli.

The remaining rats were killed off or died within six months of inoculation, and it seemed probable that none of them would have survived much longer, so miserable did they become. They all presented the appearances described above, except that no further kidney lesions were observed.

The rats of the second batch, within three months of inoculation, developed a distinctly palpable hard nodule attached to the skin at the site of inoculation and freely movable with the skin. The nodule in each case rapidly increased in size, and within another two months one was found to measure nearly four centimetres in diameter and one centimetre in thickness. There was no area of alopecia overlying it. The mass was much less hard in consistency than when it was first palpable, and on cutting through the affected area, the skin appeared to be greatly thickened owing to a pale yellowish to grey infiltration of the dermis. Except for some involvement of neighbouring lymph glands, no further lesions were found.

The remaining rats, from the sixth month onwards, became gradually lethargic and emaciated. In some, ulceration took place over the nodule, but in no case did any area of alopecia precede it. The animals began to show cannibalistic tendencies, and the last three rats were killed ten months after inoculation. In two of these the spleen was almost as much diseased as in the rats of the first batch, and the liver was also involved. These were the only rats inoculated subcutaneously in which this condition was found, but it may have occurred in those devoured. The main feature of this batch was the huge mass at the site of injection, the absence of other skin lesions, the moderate enlargement of neighbouring lymph glands, and the late involvement of spleen and liver.

The progress of the third and fourth batches may be described together, as the addition of the other organisms to the scarified surface apparently made no difference to the severity of the disease or rapidity of onset. These two batches remained healthy looking for months. One rat of the third batch died three months after inoculation from septic pneumonia, after having a lump of meat caught in its throat, but no sign of leprosy was found. In eight months or so after inoculation these rats began to look emaciated and move about less freely, and at the beginning of April, all, within a space of ten days or so, developed alopecia at the site of scarification and inoculation. Several rats have since died or been killed, and all showed the same general features. In some cases, ulceration occurred at the site of inoculation, but the skin there showed very much less nodular thickening

than in those inoculated subcutaneously. There was, however, a definite infiltration crowded with bacilli. The lymph glands in axillæ, groins and neck were enlarged, and the involvement appeared to be greater and to have occurred earlier in the glands nearest the skin lesion. Bacilli crowded into an occasional endothelial cell were found in the spleen in some cases, and in one rat in the liver also. Some rats of these two batches are still alive a year after experimental infection.

In November, 1930, subcutaneous inoculations into twelve laboratory rats were made, six with an emulsion of spleen ground up in saline solution from a rat of the first batch, and six with an emulsion made from a large skin nodule from one of the second batch. In all cases a disease similar in every aspect to that produced in the second batch of rats described above, ensued.

In July, 1930, a portion of a nodule of a naturally infected *Rattus norvegicus* was implanted under the skin of two laboratory rats. One died within two days, probably from reaction following the absorption of so much foreign protein. After nine months a skin nodule the size of a pigeon's egg had developed in the other at the site of transplantation, of characteristic consistency and appearance. The animal, on being examined *post mortem*, showed no further signs of the disease, and material from the nodule was inoculated subcutaneously into further rats, which have not yet had time to develop rat leprosy.

Similarly, a portion of a lymph gland containing acid-alcohol-fast bacilli in an occasional endothelial cell, from a naturally infected rat, was transplanted under the skin of two rats, and after nine months a typical nodule was palpable, but for a long time it was difficult to tell whether the disease had been transmitted or not. As in the previous case, further rats have been inoculated subcutaneously.

Guinea-pigs inoculated with the bacilli from several naturally infected rats have failed to develop the disease. One, killed nearly five months after the injection subcutaneously of many million organisms, still had a few very degenerated acid-fast bacilli at the site of injection, but was in good condition, fat, and no bacilli were found in other situations. Attempts at infecting them from laboratory rats with the experimental disease also failed.

A further experimental transmission of rat leprosy will be described in the section dealing with the culture of the organisms.

Cultural Experiments with the Bacilli of Rat Leprosy.

Part of the emulsion prepared on June 16, 1930, already mentioned, from a nodule of a leper rat, was stored overnight in the refrigerator, and the next day treated in the following manner, which was based on the method used by Corper and Nao Uyei for obtaining pure cultures of tubercle bacilli: (i) One part of the tissue emulsion was added to one part 6% sulphuric acid. (ii) The mixture was then incubated for half an hour at 37° C. (iii) Five parts of sterile saline solution were added to one part of the mixture in a centrifuge tube, with precaution against contamination. (iv) The saline solution and mixture, after mixing with a Pasteur pipette, were centrifuged for some minutes and the supernatant fluid pipetted off. This procedure had been found to kill off all contaminants in the case of tuberculous material, except *Bacillus tuberculosis*, and it was hoped that the bacillus of rat leprosy would be similarly isolated.

From this deposit two tubes of Dorset's egg medium prepared at the Commonwealth Serum Laboratories, Melbourne, were inoculated with a platinum loop.

One tube became contaminated by a mould that grew near the top of the medium. There was no evidence of growth apart from this after seven weeks and no growth on subculture. This tube was therefore discarded.

On the other tube, at the end of ten days there was no macroscopical growth, but a smear suggested a great increase in the number of bacilli compared with the original inoculum. They were acid-alcohol-fast, and it was noticed that terminal granules which were found on some of the bacilli in the original smears, had disappeared. A subculture was made at this time, but it became contaminated and was finally discarded.

When examined twenty-five days after inoculation (July 12, 1930), definite macroscopical growth was observed, the surface of the media being dotted with small hemispherically shaped colonies. On a smear preparation being made, it was found to be a pure culture of acid-alcohol-fast bacilli, resembling those found at the previous examination of the culture. One noticeable feature of the cultures was the tenacity with which the colonies stuck to the media and the difficulty of emulsifying the bacilli on the slide, great masses of bacilli adhering together so that red masses could just be seen on the slide with the naked eye. This was in marked contrast to the appearance of the bacilli in the original inoculum. Following the maceration of the mortar and the treatment with sulphuric acid, the bacilli were found to be strewn about, mostly singly, as the cells containing them had nearly all been broken up. This was the appearance found also in all the culture tubes where failure of growth occurred, some of the bacilli staining more faintly and less uniformly, and being less numerous as time elapsed.

On this day (twenty-fifth after inoculation) subcultures were made on to three tubes of Dorset's egg medium, and in about three weeks' time macroscopical growth, which showed the same morphological appearance in the bacilli as the original growth, was noted. Twenty-six days after subculture (August 7, 1930) further subcultures were made on to Dorset's egg medium, two from one subculture and four from another. All these subcultures grew with the exception of one, which failed for no apparent reason. On September 15, 1930, further

subcultures were made from the media inoculated on August 7, one tube of Dorset's egg medium being inoculated from each of the previous subcultures that grew. Failure of growth occurred in one tube, whilst luxuriant cultures occurred in the others, the appearance being quite characteristic.

Further subcultures have been continued up to the present time, but with apparently too long an interval elapsing during January, February and part of March, 1931, as the subcultures since then have not grown so well. A subculture made on December 5, 1930, is so thick that the colonies are confluent.

One of the subcultures made on September 15, 1930, that is, a culture of the fourth series, was on November 9 emulsified with about five cubic centimetres of saline solution and approximately equal amounts were injected subcutaneously into a batch of six young laboratory rats. These rats have all developed lesions typical of those described in Batch 2 rats in the previous section.

Besides growth on Dorset's egg medium, attempts were made to get actively growing subcultures to grow in nutrient broth and glycerine broth, both without success. Partial success was, however, obtained with nutrient agar. A subculture was made on to this medium on September 26 and colonies appeared, somewhat resembling those on Dorset's egg medium. A further subculture was made on October 31 and growth occurred, but the second subculture was a failure.

At the same time as the original cultures on Dorset's egg medium were made in June, 1930, other media were inoculated, including agar, agar containing fish extract, and horse serum with fish extract. These were all failures, and since then Dorset's egg medium has been persevered with. However, in spite of the apparent success already recorded above, all further attempts to grow acid-alcohol-fast bacilli from rat leprosy lesions have failed. These failures include attempts at culture from the lesions of naturally infected rats, similar in all respects, so far as could be judged, to the rat from which cultures were obtained, and numerous attempts from the lesions of the experimentally infected laboratory rats. It has been attempted from the lesions in the rats infected from the cultures on Dorset's egg medium, but again without success, so that the last of Koch's postulates remains unfulfilled.

It is interesting to note that Bayon's reported success was with cultures on Dorset's egg medium and glycerine agar from the spleen of a diseased rat, and that numerous attempts with other leprous rats failed.

Attempts at Transmitting Human Leprosy to Laboratory Rats, and at Culturing Hansen's Bacillus.

Early in March, 1931, arrangements were made with the Commissioner of Public Health, Queensland, for the Medical Officer in Charge, Commonwealth Health Laboratory, Rockhampton, to visit Peel Island, the State Leprosarium, and leprous nodules were excised from three patients with advanced leprosy, all of whom had received years of treatment. The material was transported in a "Thermos" flask packed with ice. A thick emulsion loaded with Hansen's bacilli was made by grinding in a mortar with glass and saline solution, and one cubic centimetre was injected into the peritoneal cavity of rats. After three months one of these animals was chloroformed, and the autopsy revealed a perfectly normal peritoneal cavity; no bacilli were found in the spleen or elsewhere. There is little prospect of the disease developing, as all attempts to produce leprosy in rats by the inoculation of human material have failed. Attempts at culture on Dorset's egg medium, after treatment of the tissue emulsion with sulphuric acid, resulted in complete failure.

Regarding the cultural work done at the Commonwealth Health Laboratory, Rockhampton, there is no doubt that an acid-alcohol-fast bacillus has been cultivated from a nodule of a leprous rat, that it has been grown in series over a period of twelve months and that a third subculture, on injection into suitable laboratory rats nearly five months after the original culture was isolated, reproduced the disease. One possible source of error appears to be present. Was sufficient of the original inoculation carried over from one culture to another on three separate occasions to cause infection in the rats inoculated, and, further, would the original bacilli have lived for this length of time? In that case, the acid-alcohol-fast bacilli grown were not pathogenic. Since in all cases where no growth occurred on attempted culture, the organisms appeared to have degenerated and lost their staining powers, this possibility appears small.

In respect of the cultivation of human leprosy, the significant work performed by Shiga provides a series of indications as to future work with *Bacillus leprœ*, as opportunity and funds permit.

Obviously, if it should be possible to cultivate, side by side, the bacilli of rat and human leprosy, their behaviour could be observed under the best conditions and any variations readily studied.

On the other hand, the experience at Rockhampton indicates, perhaps, the presence of some factor as yet undetermined, which is essential to the successful cultivation of rat leprosy, and which may depend upon some condition of the rat or some stage of the development of the bacillus cultured.

A point of interest observed in the examinations is the cannibalism shown by rats in late stages of the disease. This suggests a possible upset of their calcium metabolism similar to that seen among human lepers.

The very great importance laid by present day students upon the influence of deficient diets as a factor for leprosy in mediæval Europe, the villages of Norway, and in the present great foci of the

disease in India, China, Africa, and the Pacific Islands, suggests the importance also of controlled experiments to determine whether dietetic factors influence the susceptibility of rats to infection, the rapidity of the onset of the disease, or the severity of the disease and the rapidity of its course. Similar experiments as to the effect of partial starvation or the deprivations of various vitamins, or concurrent secondary infections, might present significant findings in respect of leprosy among native populations where these disabilities are features of the social environment.

Subject to the restrictions imposed by the financial stringency arising from the present economic crisis, experiments in this connexion are being put in hand at Rockhampton and elsewhere in the Division of Tropical Hygiene.

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PLANTS, INCLUDING FUNGI, POISONOUS OR OTHERWISE INJURIOUS TO MAN IN AUSTRALIA.[1]

SERIES III.

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IN the *Australasian Medical Gazette* for June 20, 1914, the first of a series of papers dealing with records of injurious plants met with in Australia was published. A second paper appeared in THE MEDICAL JOURNAL OF AUSTRALIA, October 10, 1925. The present paper, the third of this nature, deals with further references that have been met with during the intervening six years.

Plants Injurious on Ingestion.

Templetonia egena (Leguminosæ).—*Templetonia egena* is a common shrub, locally often called "broom," found in the drier parts of South Australia, such as north of Port Augusta.

Accompanying a specimen, dated May 7, 1892, from N. Carys Rossiter, Broken Hill, in the late J. G. O. Tepper's herbarium in Adelaide, is a note that "a woman died within an hour after drinking a cup of an infusion (tea)." No further information is available.

It is possible that the condition that led to the drinking of the infusion may have been responsible for the death.

Wattle Infusion Causing Emesis and Purgation.—Lewis,[(1)] in his account of the Lake Eyre Exploratory Expedition in 1874 and 1875, under the date January 7, 1875, at Kallakoopah Creek, says that:

During the night I suffered very much from the effects of the water from Tommy's Well; the silver wattle sticks which we put in it imparted a very disagreeable taste to the water and also rendered it a violent purgative and emetic.

The "silver wattle" here mentioned, though not identified, is not, of course, any one of the Acacias called by this name in the eastern States.

Gastro-Enteritis Wrongly Attributed to Eating Water-Melons.—In May, 1929, a newspaper reference stated that two boys had died in Perth after a supper of water-melons. Inquiry from Dr. Everitt Atkinson, Commissioner of Public Health, shows that the symptoms were those of food poisoning by a member of the Salmonella group, though this was not proved, and were in no way directly attributable to the water-melons.

The family of four became ill a few hours after eating the water-melons, with violent purging, vomiting, cramps and prostration. The two boys died, the parents, though very ill and prostrated, recovering after a prolonged convalescence—a further feature against the view that the symptoms were directly due to the melons. The *post mortem* findings on the two boys were those of acute toxæmia with small hæmorrhages in the stomach wall and fluid in the pericardial sac, with marked gastro-enteritis. Arsenic was searched for without result.

[1] Read at a meeting of the South Australian Branch of the British Medical Association on July 30, 1931.

The Juice of the Cungevoi, Colocasia macrorhiza.—The cungevoi, common in the brushes of northern New South Wales and Queensland, with its long, green, scented spadix, is a frequent ornamental plant in tubs on the verandas of houses in, for instance, Adelaide, far beyond the natural range of the plant. Dr. F. H. Beare,[4] in a note to the Medical Sciences Club of Adelaide, has called attention to the danger of this plant, a danger of which most people in these parts are ignorant. He gives examples of children affected by chewing its leaves. Dr. R. H. Pulleine,[5] in the discussion on the previous paper of this series, mentions a child he had seen who had put a small piece of the leaf in its mouth and suffered from spasm of the glottis with much salivation. Dr. John MacPherson[6] has recently contributed an article on "The Toxicology of the Arum Lily and the Cunjevoi Lily."

Poisonous Native Beans.—Alfred Giles[2] records that two men who had been engaged on the work of constructing the overland telegraph line south of Port Darwin, were attacked in October, 1871, at Maria Island, near the mouth of the Roper, with excessive vomiting and cramps in the stomach and legs after eating a quantity of native beans found growing near the beach.

Allan Cunningham, the great botanist, noted at Port Bowen, on the east coast of Australia, in 1829 a line of beach abounding with the common purple *Dolichos.* Ida Lee[3] states that it was a little north of this spot that these beans were eaten by Bligh and his starving men in 1789, with rather serious effects.

Apricot Kernels and Prussic Acid.—Dr. Eric Jeffrey, of Hobart, tells me that the late Dr. W. R. Olver, of Chatswood, New South Wales, had been called to see two boys who had been taken ill suddenly after eating many apricot kernels. One died and the other recovered with difficulty. Dr. Olver had attributed death to prussic acid poisoning.

Impaction from Dried Peas.—Dr. Jeffrey reminds me that some twelve years or more ago Dr. John Morton, at a British Medical Association meeting in Sydney, reported a case of acute intestinal obstruction in a boy following on the swallowing of dried peas, which became swollen from hydration and blocked the ileum. They were removed by enterostomy.

Injurious Effects of Pimelea (Thymeleaceæ).—Plants of this genus, with their whitish or pale yellow heads of flowers and tough, stringy cuticle, are common throughout most of Australia. Mr. Ising, of the South Australian Field Naturalists' Section of the Royal Society, informs me that a man at Wilmington, in the Flinders Ranges, who was in the habit of tasting native plants, had noticed that one species of Pimelea at least gave rise to a burning sensation in the mouth.

Poisonous Effect of Eating Leaves of Pimelea Flava.

The following history demonstrates the poisonous effects of *Pimelea flava.*

Early in 1928, two boys, V.H., aged five years, and L.H., aged three years, had been left alone by their parents for about an hour near the cliffs at Aldinga (south of Adelaide), and during that time ate a number of leaves of the small under-shrub, *Pimelea flava,* which grows in plenty in this situation. The elder said to his brother: "I bet you can't eat some of these leaves!" and then both apparently ate them, about 4.30 p.m. On arrival home at 5.15, the elder one said he felt sick, started to vomit and brought up a few of the leaves. The younger one soon vomited also. They were then given castor oil, and soon were vomiting and passing watery motions for about two hours, the younger, who had eaten more, being the worse. His parents said that from the younger "when lifted up, the motions ran out of the back passage like water through a pipe." The two children became quite exhausted, lying like two dead boys upon the bed, and as white as sheets; the younger, in fact, they thought had actually died. His mouth was forced open and brandy put in and at the same time he was rubbed; gradually the colour returned. When the doctor arrived from Willunga at 7.45 they were well on the mend.

Some of the leaves were noticed in the vomited material, so that there seems little doubt that this particular plant was responsible.

Mushroom Poisoning.—Dr. Eric Jeffrey informs me that about 1915 or 1916 a woman was sent into the Sydney Hospital suffering from "mushroom poisoning." The patient was very collapsed and the pulse almost imperceptible, but mentally she was quite clear. She recovered. Dr. C. E. Corlette has kindly made inquiries in reference to this case, but a record could not be found at the Sydney Hospital. Speaking from memory, he said he did not think there was any doubt that it was a genuine case of fungus poisoning.

The story was that the woman had become ill after eating the "mushrooms." He remembered most vividly the general condition of the patient. She looked as if she were dead so far as colour went, and was absolutely pallid; no pulse could be felt. He did not remember the condition of the pupils. There was no stupor or delirium and her mental condition was seemingly unaffected. She was indeed very like a person dying in collapse or from shock after a serious accident. So far as he remembered, there was no pain. She was not his patient in hospital, but though he had not expected her to live, he understood that she had recovered.

Plants Causing Inflammation or Irritation of the Skin.

Vesiculation Caused by Clematis microphylla.—*Clematis microphylla* is a common half-creeper in the southern parts of South Australia, and especially in the sandy soil near the coast. The natives of the Encounter Bay district are said to have known of its capacity to cause inflammation of the skin. Poultices of the leaves are sometimes employed by Europeans as counter-irritants.

In the case of my informant, a middle-aged lady, the poultice had been applied for too long a time to a knee which was affected with chronic rheumatism. To make the poultice, the leaves were stripped from the stems and cut up. Enough boiling water was poured on to make the mass sodden, and the leaves were crushed to express the juice. A fairly thick poultice was made of the leaves and juice and applied to the affected part. This was left on for seven minutes, whereas it should have been applied for not more than three. On removal, nothing was apparent except redness. Twelve hours later blisters were forming, which were ruptured. The patient had to keep in bed for a week and the knee was painful for another ten days, but the rheumatism was much benefited.

Irritation from Stinkwort (Inula graveolens).—Dr. Wettenhall,[7] before the Victorian Branch of the British Medical Association, has described a case of *dermatitis venenata* in which stinkwort was suspected.

The patient was a labourer in the mallee district of Victoria. There were redness, vesiculation and some crusting and much exfoliation, affecting especially the hands and arms and to some extent the face. The condition cleared up in Melbourne, but returned when he went back to his former environment and slept in his old blankets.

H. R. Seddon[8] mentions slight transient irritation of the skin of the face and hands from handling stinkwort near Sydney.

Euphorbia helioscopia L. (Sun Spurge).—Mr. Rodway, of Hobart, informs me that a man at the Botanical Gardens there developed a rash on his face and hands from handling this plant, *Euphorbia helioscopia.*

Irritation from Chilli Beans (Capsicum frutescens).—On December 17, 1930, two girls, aged seventeen and eighteen years respectively, reported at the casualty room at the Adelaide Hospital and were seen by Dr. Dwyer, who kindly supplied the following notes.

They were suffering from intense skin irritation on their hands, attributed to working with chillies. The pain was rather severe. The whole surface, both extensor and flexor, of each hand was reddened, but there was no vesication then or later. The trouble was not localized to any special part of the hand, except that the flexor aspect and palms were affected rather more than the extensor aspect in one case. The patients were treated with a paraffin dressing at the factory, and in the casualty room this was removed and a picric acid dressing applied. Next day all pain and discomfort had disappeared. In one patient there seemed a tendency to superficial desquamation, but this may have been due to the picric acid. The patients said that similar trouble had occurred amongst other workers at the factory (preserving works).

The chilli beans that were being used, were first soaked in vinegar and put out on a table for the work to be done. They were still wet when handled, but the workers used rubber gloves which were believed to be water-proof. It is noteworthy that the area affected did not extend beyond that covered by the gloves.

Dermatitis and Skin Injuries Due to Woods.

Scratches "Festering" from Red Mulga.—The red mulga (*Acacia cyperophylla*, F.v.M.) is a remarkable Acacia from whose stems the reddish bark hangs in patches and shreds as if from laceration by the horns of a bull. It is found growing near Hamilton Bore, north of Oodnadatta, and also north of the Cooper at Innamincka. The wood polishes remarkably well. Scratches by the wood are said to be particularly liable to fester. It should be remembered, however, that those who meet with this timber growing, are quite likely to be living on a minimum of fresh food, and particularly fruit, which may make scratches and similar injuries more liable to become infected.

Dermatitis from Woods.—Dr. John MacPherson[9] has described a dermatitis caused by Queensland maple (*Flindersia chetawaiana* Bailey).

Dr. H. Nott,[10] in the discussion on the previous paper of this series, described his personal experience of the irritating effect of blackwood (*Acacia melanoxylon* R.Br.) sawdust. After working with the wood he got a crop of small red pimples on the back of his hands and forearms.

Sensitivity to Pollens and Hay Fever and Asthma.

In *Health*,[11] in 1905, is given a note on the relative frequency of sensitivity to various grass and other pollens in Australia.

Dr. E. Derrick[12] has recently recorded the "Sensitizing Agents in 2,220 Applications to the Allergin Department of the Commonwealth Serum Laboratories." Of all the substances tested rye grass (18%), cocksfoot grass (14·8%) and Capeweed (12·2%) head the list.

Injuries from Grass Seeds.

It is remarkable that injuries in man from grass seeds are not more frequent, when one considers the backward-directed barbels that cover the awns in some cases. These are obviously placed so as to aid penetration and prevent the seed from retracing its steps. We have probably all experienced that distressing symptom when such a grass seed has been placed in the mouth and reflex muscular movements tend to force it onwards. In parts where spear-grasses (*Stipa* sp.) are abundant, the fleeces and skins of sheep may be penetrated by thousands of seeds whose progress is facilitated by the spirally twisting awns. The grass seeds may pierce the flesh, giving rise to hæmorrhages and much disfigurement and leading to condemnation of the carcass.

Kent Hughes[13] has recorded an abscess in the lung due to a grass seed. T. G. Sullivan[14] gives the following history.

A child had been ill for a week with a sore throat, which was getting worse, so that finally the child could not swallow and breathing was obstructed. There was a large abscess in the soft palate, which was incised. Next day a wild oat seed was found working its way out of the wound.

Ida Lee[15] gives a quotation from Sir Joseph Banks, referring to experiences on Thirsty Sound.

They met with an irritating grass whose "sharp seeds were bearded backwards, and wherever they stuck into our clothes were by these beards pushed forward till they got into the flesh. . . . This grass, with the mosquitoes that were likewise innumerable, made walking almost impossible."

An Australian Plant as a Killer of Flies.

W. Bauerlen[16] is quoted by the late J. H. Maiden in his "Forest Flora of New South Wales" as stating that a bunch of flowers of the proteaceous plant *Stenocarpus sinuatus* Endl., the fire-wheel tree, put in a vase, was found to kill flies in large numbers.

Healing Virtues Attributed to the Juice of the Milk Bush or Tableland Caustic Bush, Sarcostemma australe R.Br.

Miss Olive Pink informs me that on the railway line between Marree and Oodnadatta, the fettlers, copying the natives, use the milky juice of the milk bush as a healing liquid on cuts, and find it most efficacious.

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SOME OBSERVATIONS ON THE BENDIEN TEST FOR CANCER.

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BENDIEN[1] has recently described a diagnostic test for cancer which depends upon the precipitation of the proteins in blood serum by a series of twenty mixtures containing increasing amounts of sodium vanadate and decreasing amounts of acetic acid. Only the first ten of these mixtures, whose pH ranges from 3·3 to 3·5, are necessary. Bendien finds that, whereas with normal sera the lowest tube of the series in which precipitation occurs, is number 6, with the sera in cancer (except of the breast) and in metastasizing sarcoma, epithelioma and cancer of the breast, precipitation occurs in tubes lower in the series. This is also the case in active pulmonary tuberculosis, jaundice, diabetes, pleurisy, malaria, nephritis, diphtheria, scarlet fever, furunculosis and during the later months of pregnancy.

As a further refinement of the test Bendien examines the ultra-violet absorption spectrum of a 1% solution of the protein precipitated in tube 5 and claims to be able thus to differentiate cancerous from other sera. Smith, Holiday and Marrack[2] have recently pointed out that the criteria upon which Bendien makes this differentiation are unsound, and they maintain that the spectrophotometric method applied to Bendien's precipitates has no value in the diagnosis of cancer.

In the present communication we report the results of 277 tests in which we have not applied the spectrophotometric method, but instead have attempted to ascertain the value of the initial test in the diagnosis of cancer when the results are considered quantitatively. Despite the relatively small numbers of tests we have carried out, we have found conditions other than those noted by Bendien which are associated with precipitation in the lower tubes of the series.

Technique.

In carrying out the test we have adhered as closely as possible to the technique laid down by Bendien. Blood was collected aseptically in clean sterile tubes by puncture of the median basilic vein, stout needles, each with a short piece of tubing attached to it, being used. The patients were at rest in bed and the samples were collected in the morning, no food having been taken since the evening of the previous day. The clot was separated from the sides of the tubes, which were then allowed to stand for thirty-six hours at 2° C. before the serum was pipetted off and centrifuged.

In the preparation of sodium ortho-vanadate 18·2 grammes (0·1 mole) vanadium pentoxide and 31·8 grammes (0·3 mole) anhydrous sodium carbonate were mixed and fused in a nickel crucible. The mass was dissolved in boiling water and the solution filtered. Crystals of sodium vanadate separated on cooling. They were filtered from the mother-liquor by suction and dried for forty-eight hours in the air at the temperature of the laboratory, 16° to 18° C. Repeated crystallization and drying results in crystals containing different proportions of sodium and of water of crystallization. Beyond alluding to his material as a decahydrate, Bendien gives no precise data concerning its composition. The substance prepared in this laboratory contained water of crystallization corresponding to $Na_3VO_4 11H_2O$. The vanadate solution used was made by dissolving 12·2 grammes per litre. A variation in the percentage of water of crystallization from that used by Bendien does not invalidate the comparative value of our results and at worst might involve the shifting of the values obtained by us to tubes one place lower in the series.

In carrying out the actual test, Bendien's technique was followed exactly as set out on pages 2 and 3 of his book and the results were read after standing at room temperature for twenty-four hours. In reading the results we not only noted the number of the lowest tube in the series in which a precipitate was present, but also, taking account of the amount of precipitate and the clarity and colour of the supernatant fluid, estimated and recorded the degree of precipitation in each tube in the series, giving 10 for complete precipitation and smaller numbers of less amounts. After reading, the tubes were centrifuged and the amount of vanadium in the supernatant fluid was estimated by the following method, which has an error of about 5%.

Into a 50 cubic centimetre Erlenmeyer flask one cubic centimetre of the supernatant fluid was accurately measured and one cubic centimetre of 50% (volume) acetic acid and one cubic centimetre

of 10% potassium iodide were added. The flask was then placed in the boiling water bath for ninety seconds and cooled under running water and the iodine liberated was titrated immediately with 0·005N sodium thiosulphate after the addition of 0·2 cubic centimetre of 1% starch paste.

Results.

The results of the precipitation test as carried out and recorded by Bendien are summarized in Table I, where the figures in parentheses standing after the numerals indicate the number of cases in which the corresponding tube was the lowest in the series to show definite sedimented precipitate after standing undisturbed for twenty-four hours. It will be noted that our group of 26 normals show, with one exception, a higher figure than Bendien's large series (560) between the ages of 16 and 65, which precipitated first in tube 6. Bendien, however, admits that very healthy individuals may precipitate first in tube 7 or 8, and our normals were all in good health and free from pyorrhœa or other chronic infections.

TABLE I.

Results of Bendien Test in 277 Cases.

Condition.	Age.	Numbers tested.	Lowest number of tube showing precipitation.
Normals	16-50	26	6 (1), 7 (8), 8 (12), 9 (5).
Traumata	16-77	22	2 (1), 3 (4), 4 (4), 5 (8), 6 (3), 7 (1), 8 (1).
Acute Infections	14-58	55	1 (25), 2 (7), 3 (4), 4 (8), 5 (7), 6 (2), 7 (2).
Chronic Infections—			
Pulmonary Tuberculosis	14-70	13	1 (2), 3 (2), 4 (4), 5 (1), 7 (4).
Surgical Tuberculosis	15-44	6	1 (1), 4 (1), 5 (1), 6 (2), 7 (1).
Syphilis	32-70	10	2 (1), 3 (2), 5 (2), 6 (3), 7 (2).
Other	16-65	4	5 (1), 6 (3).
Nephritis	18-42	5	1 (1), 3 (2), 5 (1), 7 (1).
Goitre	27-44	5	3 (2), 5 (1), 7 (2).
Hydatid disease	31-46	2	1 and 2.
Jaundice	33-71	8	1 (5), 2 (1), 6 (2).
Anæmias	23-67	4	3 (1), 5 (1), 6 (1), 7 (1).
Late Pregnancy and Complications	19-45	6	1 (1), 3 (1), 4 (3), 5 (1).
Disseminated sclerosis	36-38	2	6 (2).
Mixed group	19-61	5	6 (3), 7 (1), 8 (1).
Hodgkin's Disease	21-51	2	2 and 7.
Sarcomata	11-81	8	2 (1), 3 (3), 5 (2), 6 (1), 8 (1).
Dermoid tumour	65	1	4.
Epitheliomata	39-89	28	1 (1), 2 (6), 3 (4), 4 (6), 5 (3), 6 (3), 7 (4), 9 (1).
Rodent ulcer	54-65	5	3 (1), 4 (1), 6 (3).
Carcinomata—			
Alimentary tract	42-69	19	1 (8), 2 (3), 3 (4), 4 (2), 6 (1), 7 (1).
Genito-urinary system	32-83	37	1 (7), 2 (4), 3 (6), 4 (9), 5 (4), 6 (2), 7 (5).
Lung	45-62	2	1 and 2.
Cerebral Tumour	40	1	8.
Prostatic Hypertrophy	74	1	4.

The Influence of Trauma.

The influence of trauma was studied in a gunshot wound received two days earlier, and in simple fractures, simple fractures reduced by open operation, and compound fractures tested at times ranging from four days to four months after the accident or operation. A small group of tests was also carried out four to six days after simple aseptic operations for the repair of inguinal hernias, the removal of a vesical stone, the separation of abdominal adhesions and the excision of a semilunar cartilage. It will be noted that all but five of these tests showed precipitates in lower tubes than normal. Of the post-operative cases one gave a reading of 8 and one of 6, six days after operations for hernia and for displaced cartilage. The only two compound fractures, both of the leg bones, gave readings of 7 and of 6 one month and five days respectively after their accidents, and, finally, a simple fracture of the tibia and fibula, tested six weeks after the accident, gave a reading of 6. A reading of 2 was obtained from the serum of a patient with Paget's disease who had sustained a fracture of the femur twelve days before.

Sufficient evidence is here afforded that trauma causes precipitation in tubes lower in the series than normal.

Acute Infection.

It is interesting to note that all acute infections involving serous membranes gave very low readings. This is well illustrated by those cases of gonorrhœa in which urethritis was complicated by arthritis. Here precipitation occurred in the first tube and in three other cases of infective arthritis the results were 1, 1 and 2. Gonorrhœa complicated by prostatis or epididymo-orchitis gave higher readings, 3, 4 (3), and 6. Our single acute pericarditis gave a reading of 1, as also did all five examples of appendicitis complicated by general peritonitis. In four with abscesses, three gave a reading of 1 and one of 2. In subacute appendicitis the figures were 4, 5 (2), and 7, the last proving to have an almost normal appendix.

As is indicated in Table I, almost all the acute infections investigated showed precipitation in tubes low in the series. These included lobar and bronchopneumonia, bronchitis, influenza, typhoid fever, acute pancreatitis, carbuncle, erysipelas, acute cholecystitis without jaundice, ulcerative colitis, osteomyelitis, pyonephrosis, infective endocarditis, *erythema nodosum*, *pemphigus vegetans* and acute *otitis media*. The only conditions giving normal values were one gonorrhœal periurethral abscess tested five weeks after the onset of the infection, and the patient mentioned above, whose operation disclosed a normal appendix.

Chronic Infections.

Chronic infections included pleurisy, dry and with effusion, pulmonary tuberculosis, tuberculous glands of the neck, tuberculous kidney, tuberculous peritonitis, Bazin's disease, tertiary and quaternary syphilis, chronic ulcer, chronic mastitis and diverticulitis of the colon. The pleurisies have been included in the table as pulmonary tuberculosis. The sera from a patient with dry pleurisy, tested fourteen days after the onset, from two with hæmoptysis in which the diagnosis of pulmonary tuberculosis was not certain, and from one of supposed latent tuberculosis, precipitated first in tube 7, as also did that from the patient with tuberculous ulceration of the legs of seventeen years' duration. A reading of 1 was obtained from the serum of a patient with open pulmonary tuberculosis and of another with tuberculous peritonitis complicated by a fæcal fistula.

The examples of syphilis included one gumma of the liver without obvious jaundice, which yielded a precipitate in tube 5. In aneurysm, aortic regurgitation and cerebro-spinal syphilis associated with strong positive Wassermann reactions deviating respectively 40, 28 and 22 minimal hæmolytic doses of complement, precipitation occurred in tubes 3, 5 and 6. In cardio-vascular or cerebral syphilis with weaker Wassermann reactions or with no reaction, the result varied between 2 and 7. Unfortunately we were unable to test cases of primary and secondary syphilis, but our results do not support Bendien's contention that syphilis tends to inhibit precipitation in the lower tubes.

Nephritis.

Only five patients with nephritis were available. Low figures were obtained from two with chronic disease and from one with acute "hæmorrhagic" nephritis and œdema. An acute nephritis, one month after the onset, when the condition was improving, gave a reading of 5, and a very mild subacute nephritis one of 7.

Goître.

Normal figures were obtained for an exophthalmic goître patient with a basal metabolic rate of −3%, treated with Lugol's solution, and for one thirteen days after thyreoidectomy. In two, before subtotal thyreoidectomy, the results were a 5 and a 3, though the basal metabolic rate in the first was +69%, and in the second had been reduced from +28% to normal. The remaining patient, whose reading was also 3, should be classified elsewhere. Subtotal thyreoidectomy had been performed three months earlier, and she was suffering from coronary and pulmonary thrombosis.

Hydatid Disease.

In two patients with hydatid disease of the liver, neither of whom was obviously jaundiced, the condition was complicated by infection, and to this, rather than to parasitic infection, the low readings obtained may well have been due. In one of them the cyst had been drained five days previously.

Jaundice.

Bendien found that in gall stones without icterus the reading was 5, but with icterus much lower values were obtained. Of our eight patients with jaundice, five gave a reading of 1. In four of these the diagnoses were uncertain, but were probably stone in the common duct, and malignant disease of the liver, gall bladder and pancreas respectively. The remaining patient had a cellulitis of the foot. Two patients with obstructive jaundice of a month's duration and enlargement of the liver and spleen, gave readings of 6, and one with jaundice of six months' duration a reading of 2.

Anæmias.

Bendien does not record any results in anæmias, but we anticipated that these would also show precipitation in tubes low in the series. This proved to be the case. A patient with Banti's disease gave a reading of 3, and three with pernicious anæmia readings of 5, 6 and 7 respectively.

Pregnancy and Complications.

Two normal pregnant women in the first stage of labour showed readings of 4, and two with albuminuria of pregnancy, near to term, readings of 5 and 3. Finally, a patient forty weeks pregnant, in the first stage of labour, with a preeclamptic toxæmia, a blood pressure of 160 and the urine loaded with albumin, gave a reading of 1.

Disseminated Sclerosis.

Bendien's cases of disseminated sclerosis gave readings of 5, and in the two we examined, readings of 6 were obtained. The remainder of our controls formed a mixed group, including patients with malaria, plumbism, xanthoma, *thrombo-angiitis obliterans* and auricular fibrillation. The first gave a reading of 7, the second of 8, and the remainder of 6.

Hodgkin's Disease.

Two patients in whom Hodgkin's disease had been evident for five and four months respectively, gave results of 2 and 7. We can offer no explanation of the low reading in the first of these.

Lymphosarcoma.

Two patients with lymphosarcoma gave readings of 5 and 3. The second was tested on two occasions with identical results. The condition here was complicated by sepsis. The other patient had had radium mass treatment (20 gramme-hours), commencing six days before his test, and this may have affected the result.

Sarcoma.

There were six other patients with sarcoma in our series. Three of these, with obvious metastases, gave readings of 3, 3 and 2, and in one of these the administration of radium, commencing five days before the test (20,000 milligramme-hours), may have had some effect. Of the remainder, one had a retro-peritoneal sarcoma of recent origin and gave a result of 6, one had had a retro-peritoneal sarcoma treated by deep X ray therapy two years before, now had suspicious masses in the breasts and gave a reading of 5; the last patient, who had had the uterus removed four months before for a sarcoma, showed no obvious recurrence and gave a reading of 8.

A very extensive recurring fibroma in the abdominal wall was associated with a test result of 4. This patient had had radium emanation embedded five days previously, which may have had some influence on the result.

Epithelioma.

We tested the sera of 28 patients with epithelioma in various situations. One of these, with an epilaryngeal growth, had bronchitis and gave a reading of 3, and in two others with a reading of 2 the result was complicated by sepsis. Many of the remaining patients were tested four or five days

after the commencement of radium treatment, and this may have had some effect upon the result, though it is not possible to evaluate it.

Excluding the results in patients whose condition was obviously complicated by infection, it is noteworthy that all the low results were in those treated with radium. In three, tested twenty-one, eighteen and eight days after a large dosage of radium, figures of 2, 2 and 3 were obtained. It is therefore possible that treatment with radium causes precipitation in lower tubes in the series.

In five patients treated with radium and in whom no obvious metastases were present, the readings were 9, 7 (2), 6 and 4, but the complicating effects of radium deprive our results of value in confirming Bendien's statement that epitheliomata of the skin without metastasis generally give normal figures.

Rodent Ulcer.

In our series there were five patients with rodent ulcer, none of whom had received recent radium treatment. Three with ulcers of small size gave readings of 6, and the two extensive lesions which presented a large area for septic absorption, were associated with precipitation in tubes 4 and 3.

Carcinoma.

It was to be anticipated that lesions of the alimentary tract would, if at all advanced, be associated with sufficient septic absorption to affect the result of the test. These, except one, were uncomplicated by radium treatment, and in this case, of cancer of the œsophagus of eighteen months' duration, there had been numerous X ray and radium treatments, the most recent of which was a mass treatment of 100 gramme-hours, extending from ten days before to three weeks after the test. In this the reading obtained was 7. The serum of the other patient with carcinoma of the œsophagus was precipitated in tube 3. There were nine patients with carcinoma of the stomach, and the result in all was uncomplicated by radium treatment. The sera of six of these precipitated in tube 1, that of two others in 2, and that of the remaining one, a gizzard carcinoma without metastases, in tube 3.

There were four patients with carcinoma of the colon uncomplicated by radium treatment. One of these, in whom the diagnosis was doubtful, had a fæcal fistula. The result in her case was 6. In two patients with metastasis the result was 1, and in one, two months after resection of the tumour, a reading of 3 was obtained.

There were four patients with carcinoma of the rectum. In one, seven days after excision of the rectum, a reading of 3 was obtained. In another, with extensive perianal fungation, the reading was 2, and in a third patient, with an operable growth, it was 4. In the fourth a reading of 4 was also obtained, though this may have been influenced by treatment with radium, which was commenced five days before the test was made.

A patient with carcinoma of the bladder gave a reading of 4, and one with a renal carcinoma, one of 2. The serum from a patient with supposed renal carcinoma was precipitated in 6.

There were two patients with carcinoma of the prostate. One with extensive metastases and bronchopneumonia gave a reading of 1, and the other, in whom metastases were also present, gave a reading of 3. A patient with adenoma of the prostate gave a result of 4.

There were eight patients with carcinoma of the breast. Two were tested five and nineteen days after radical excision and their sera precipitated in tubes 2 and 4. Three had extensive metastases, and the results of their test were 3, 3 and 4. A patient in whom the breast was excised nine years before, returned with a small metastasis in the clavicle and gave a normal result when tested. A similar result was obtained with the serum of a patient in whom there was a recurrence in the scar a year after radical operation and with that of another rather doubtful case in which also a radical operation had been performed.

There were nine patients with carcinoma of the ovary, and in seven of these there were metastases in the peritoneum. This group gave readings of 1 (5), 2 and 4. The remaining patients had been operated on eighteen days and one month before the test, and gave readings of 3 and 5 respectively.

There were fourteen patients with carcinoma of the cervix, ten of whom were advanced and were being treated with radium. The results in these were 5 (3), 4 (5) and 3 (2). The serum of a patient with an early lesion gave a reading of 6, and that of one with a precancerous lesion a reading of 7. One patient tested five days after panhysterectomy gave a reading of 2, and another, in whom exploration revealed metastasis in the pelvic glands, gave a reading of 1. The serum of a patient in whom it was uncertain whether a carcinoma of the body of the uterus was present, yielded a normal result, and section of the excised organ proved it to be non-cancerous.

These results clearly indicate the non-specificity of the reaction. Though it may possibly prove of diagnostic value in a few patients in whom trauma and infection can be excluded with certainty, it seems unlikely that much reliance will be placed upon it unless some further refinement can be devised to make it more strictly specific.

Further Investigations.

We have attempted to ascertain whether the results given by the test could be made more valuable if considered quantitatively. We found that the results of the chemical estimation of the amount of vanadium in the supernatant fluid and of our estimation of the extent of precipitation were reciprocal and that it was possible to predict one from the other. We shall therefore confine our attention here to the results of the chemical estimations.

We carried out 150 of these tests. In analysing the results we have divided them into two main

groups. One contains the results of tests of sera of patients after trauma or with acute or chronic infections, and the other of sera of those patients with various kinds of new growth. Dealing first with this latter group, we excluded from consideration rodent ulcers, epitheliomata of the skin without metastasis and sarcomata, and proceeded to plot an area on the graph (Figure I) which contained

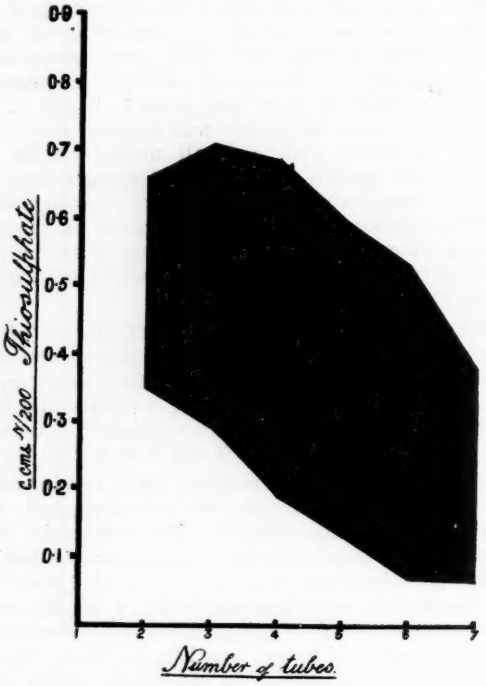

FIGURE I.

the results of 30 out of 40 of the cases of carcinoma and of epithelioma with metastasis. Of those which fell below the area, seven were excluded in determining it, because the tests were made a few days after exploration or the application of a massive dose of radium. In the remaining three cases the results were almost within the normal range (Figure II). One was a carcinoma of the œsophagus, one an epithelioma of the lip with a small gland in the submaxillary region and the third a small metastasis in the clavicle following a carcinoma of the breast removed some years before.

Having thus determined the area within which the results from cancerous patients might be expected to fall, we now investigated the results in patients with trauma and acute and chronic infections. Of 71 of these the results in 50 fell within the cancer area. It is therefore evident that the method under consideration adds nothing to the value of the test.

Conclusion.

The precipitation of serum proteins in the Bendien test is not sufficiently specific to be of decisive value in the diagnosis of cancerous conditions, and quantitative readings of the amounts of precipitate in the tube or of the vanadium remaining in the supernatant fluid did not make the results any more specific.

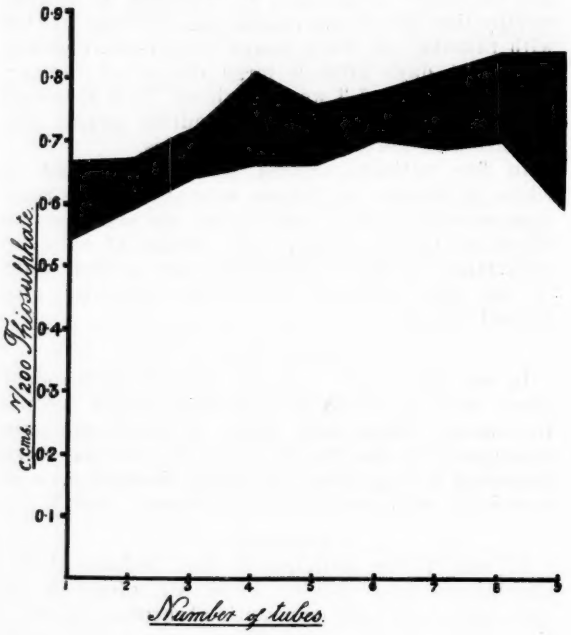

FIGURE II.

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BEDSIDE BLOOD SUGAR ESTIMATION: A NEW CLINICAL METHOD.

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URINE analysis is notoriously unreliable as a guide to treatment in cases of diabetic coma; on the other hand, accurate blood sugar estimation, on which alone reliance can be placed, has hitherto only been possible if a laboratory and a biochemist have been within easy reach. Any method of carrying out this estimation, therefore, which can be performed at the bedside and which postulates no technical skill whatever, is obviously well worth investigation.

Such a method is the Crecelius-Seifert colorimetric process. Of the simplicity and speed of this method there can be no question. The present investigation has been carried out to determine the degree of accuracy which can be obtained by its use

[1] Read at a meeting of the Western Australian Branch of the British Medical Association, June 17, 1931.

in comparison with that obtainable with one of the more widely known techniques.

The apparatus required for the performance of the estimation is as follows:

Colorimeter ("*Blutzucker-Kolorimeter nach Crecelius-Seifert*," made by Carl Zeiss, Jena. Price RM40.
Capillary blood pipette to contain 0·2 cubic centimetre (supplied with the colorimeter).
Precision tube (a small test tube supplied with the colorimeter).
Graduated pipette, one cubic centimetre.
Graduated pipette, two cubic centimetres.
Pipette to contain one cubic centimetre.
Filter funnel.
Filter paper (Whatman Number 41).
A few small test tubes.
Sodium hydroxide, 10%.
Picric acid, 1·2% aqueous solution.
Gas or spirit lamp.

The finger or the lobe of the ear is punctured and the capillary pipette filled with blood to the 0·2 cubic centimetre mark, exactly as in other micro methods. This blood is then expelled into a small test tube containing 1·8 cubic centimetres of distilled water, care being taken to empty the pipette thoroughly. To the test tube containing the laked blood one cubic centimetre of 1·2% picric acid solution is added. The resultant mixture is well shaken and allowed to filter; about 1·5 cubic centimetres of filtrate are usually obtained. To this filtrate 10% solution of sodium hydroxide is added in the proportion of one part sodium hydroxide to ten parts filtrate (in practice I find the addition of 0·15 cubic centimetre sodium hydroxide gives sufficiently accurate results). The mixture is then heated over a flame till no further colour change occurs; it suffices to bring the fluid just to the boil two or three times. After cooling the fluid is poured into the precision tube and the latter is inserted in the colorimeter. The matching of colours must be done within five minutes of the heating; the result is read off directly from the scale on the apparatus.

With a little practice the whole procedure can be carried out comfortably within eight minutes. No technical skill is needed beyond that required to obtain the blood. The variation in results introduced by the personal factor and inherent in all colorimetric methods is apparently very small, since five observers, all new to the method, obtained results which in no case varied more than 0·01% from my own reading.

In order to investigate the accuracy of the Crecelius-Seifert method I have carried out thirty-five blood sugar estimations by this process and have controlled these in each case by parallel estimations by the MacLean method. The corresponding bloods were taken within two minutes of each other. The colorimetric results were in all cases recorded before the MacLean results were known. Some of the colorimetric estimations were carried out in daylight, others by artificial light; the nature of the lighting apparently does not affect the accuracy of the results to any appreciable degree.

The following results were obtained in thirty-five consecutive cases.

Crecelius Seifert	0·110	0·090	0·130	0·140	0·120	0·140	0·090	0·200
MacLean .. .	0·110	0·060	0·130	0·140	0·120	0·150	0·090	0·230
Crecelius Seifert	0·160	0·130	0·140	0·130	0·110	0·100	0·180	0·220
MacLean .. .	0·180	0·135	0·150	0·140	0·120	0·130	0·150	0·180
Crecelius Seifert	0·170	0·160	0·230	0·125	0·160	0·120	0·110	0·240
MacLean .. .	0·155	0·140	0·210	0·110	0·150	0·110	0·130	0·240
Crecelius Seifert	0·110	0·265	0·255	0·125	0·080	0·270	0·260	0·230
MacLean .. .	0·135	0·240	0·210	0·100	0·100	0·240	0·305	0·200
Crecelius Seifert	0·190	0·160	0·150	—	—	—	—	—
MacLean .. .	0·210	0·150	0·140	—	—	—	—	—

In six cases the results corresponded exactly; in sixteen cases the colorimetric result was the higher; in thirteen cases the MacLean result was the higher.

In thirty-two cases out of thirty-five the difference between the results was not greater than 0·03%; in no case was the difference greater than 0·045%; the mean difference was 0·018%.

In no case was the discrepancy between the two results sufficiently large to leave any doubt either as to the clinical state of the patient or as to the appropriate treatment.

Simplicity, speed and a degree of accuracy sufficient for clinical purposes seem to me sufficient to justify the adoption of the method in routine diabetic work. I intend to use it in my own practice in all cases except those in which a very precise evaluation of the blood sugar is required; the degree of accuracy attained is not sufficient for such work as the carrying out of a lævulose tolerance test, for which the more tedious but more precise methods of MacLean, Hagedorn-Jensen or Folin-Wu must still hold pride of place.

Acknowledgements.

My thanks are due to the members of the honorary medical staff of the Perth Hospital for their courtesy in allowing me to perform blood sugar estimations on their patients.

Reports of Cases.

HYDRONEPHROSIS DUE TO AN ABNORMAL VEIN.[1]

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HYDRONEPHROSIS has formed the subject of much investigation and for numerous contributions to current medical literature.

Aberrant vessels entering or leaving the lower pole of the kidney are the most common obstruction at the ureteropelvic junction causing this condition. These anomalous vessels may run anterior or posterior to the ureter and may enter or leave the anterior or posterior surface of the kidney.

That the mere presence of these anomalous vessels is not the whole cause of the pathological condition is proved by the number of cases in which one finds no pathological changes associated with their presence.

One also occasionally meets abnormal vessels when removing a kidney for hydatid disease, malignant disease or some other pathological condition without any evidence

[1] Read at a meeting of the Newcastle Hospital Clinical Society on June 3, 1931.

of obstructive symptoms; indeed, a severe hæmorrhage from an abnormal vessel seen early in practice makes our observation of these anomalies in direct ratio to our past experience.

Eisendrath[1] has truly stated that the mobilization of the kidney should be gradual, care being taken both at the lower and upper poles, never to tear or divide adhesions or strands of fibrous tissue before they have been inspected to exclude the presence of a supernumerary vessel.

Robinson,[2] in dealing with abnormalities of the renal artery, states that accessory arteries are more common on the left side than the right side, and arise more frequently below the ordinary vessel than above it.

Accessory renal arteries may be derived not only from the aorta, but also from the common iliac or hypogastric arteries; they have also been described as arising from the inferior phrenic, spermatic, lumbar, middle sacral and even from the external iliac artery.

Duval and Grégoire[3] and Ekehorn[4] were amongst the first observers to direct attention to the part which accessory vessels to the lower pole of the kidney may play in the causation of hydronephrosis. Ekehorn in 1907 found an artery going to the lower pole of the kidney in front of the ureter in 64 and behind it in 84 specimens.

Mayo[5] in 1909 reported 20 out of 27 cases of hydronephrosis associated with anomalous vessels. The obstruction in each instance was at a point where these vessels crossed the uretero-pelvic juncture; in all but two the arteries came from the renal, sometimes passing in front and sometimes behind the ureter. In 13 out of the 20 cases severing the anomalous vessels sufficed to remedy the condition.

Since that time many other observers have reported cases showing that anomalous renal vessels occur more frequently than is generally supposed, most of them dealing with abnormal renal arteries.

An interesting case demonstrating aberrant renal vessels has recently been reported by Cecil,[6] in which two vessels entered the lower pole of the kidney, one in front and one behind the ureter.

Walker[7] reported a case of hydronephrosis in a boy of thirteen, which was cured by division of a band containing an aberrant artery and vein, the size of ulnar vessels, crossing in front of the uretero-pelvic junction to the anterior surface of the lower pole of the left kidney.

In Walter's[8] experience the anomalous vessels are usually an artery and vein which cross and change the angle of uretero-pelvic drainage.

Quinby's[9] patient was a girl of fourteen, who incidentally recovered and seven years later reported she had married and had gone through one pregnancy without untoward result. An aberrant artery was found lying in contact with the ureter at its junction with the pelvis, and anterior to it. It entered the lower pole of the kidney, and was accompanied by two veins of considerable size. Examination of the hilum failed to demonstrate any normal renal artery.

Ruppert[10] was really the first to call serious attention to the presence of anomalous veins. He states that while anomalous veins are not as frequent as anomalous arteries, their presence increases the hazards of renal operations, especially in a nephrectomy. On account of the thinness of their walls, they give but little, if any, more resistance to traction than a small adhesion, and as pulsation is absent, an anomalous vein is difficult to differentiate from an adhesion, unless it can be drawn into the field.

Two cases reported by Quinby[11] were accompanied by abnormality of the veins, the arterial supply being normal.

Mathé,[12] in reporting eleven cases, two also of which were due to anomalous veins, points out that although anomalous veins do not occur so often as anomalous arteries; when associated with movable kidney they are as important as the latter in the production of hydronephrosis.

Schmidt[13] reports six cases out of sixteen operations for hydronephrosis which were due to supernumerary blood vessels, a vein crossing the ureter towards the lower pole of the kidney being the causal agent in one of the six cases.

An interesting case of hydronephrosis complicated by compression of the ureter by a normal branch of the renal vein has recently been recorded.[14]

In discussing symptomatology it must be remembered that abnormally running vessels occur in kidneys in which they cause neither symptoms nor damage. In a series of thirteen cases reported by Stevens,[15] one had symptoms for only one week, another for two years, and all the others from ten to twenty-three years. Quinby[9] in his latest article draws attention to the experimental production of hydronephrosis in animals by (*a*) a piece of ligature laid loosely about the ureter and (*b*) circular painting of the ureter with phenol, thus demonstrating that hydronephrosis can be caused experimentally by inhibition of peristalsis without any mechanical obstruction of the lumen of the ureter. In other words, the ureter is composed of smooth muscle fibres, whose reaction to many forms of stimuli is known to be extremely labile. In view of these known facts, Quinby suggests for consideration that the cause of the hydronephrosis associated with an abnormality of the blood supply is to be found merely in the pulsations of the artery itself, lying in juxtaposition to the ureter and inhibiting there the normal flow of peristaltic waves. No mechanical obstruction is necessary, he says, but the current of action set up by each arterial beat is quite sufficient to cause nervous interference of a minor degree in the ureter. Acting thus from the birth of the individual, a slowly increasing dilatation of the renal pelvis ensues. When this reaches a sufficient size, symptoms appear, and it is interesting to note, Quinby states, that many of these patients date the onset of symptoms at some period during their second ten years of life.

The symptoms which may arise as a result of an aberrant vessel, may be classified as painful, gastro-intestinal and urological.

Pain is as a rule intermittent, and in the absence of a tumour may be erroneously attributed to some other organ. It varies in intensity, position and duration, and may be referred to the right hypochondrium, lumbar region, or may radiate along the course of the ureter. It may disappear entirely after an attack or a more or less continuous dull ache or sensation of fullness may persist in the interval.

Renal pain is generally more severe at the onset, when distension is increasing and renal secretion good, but when the hydronephrosis is large and the kidney parenchyma considerably reduced in quantity, pain appears to be less severe, the presence of a tumour being uppermost in the patient's mind.

Gastro-intestinal symptoms, which may or may not be accompanied by renal colic, also vary with the development of the condition, whilst urological symptoms, frequency, burning, may be present only in cases complicated by infection.

At present there is no known method of actually demonstrating an aberrant vessel. Hillstrom,[16] after reviewing the literature, concludes that ureteral catheterization may give useful information, but may also be misleading. The most reliable information, he states, is obtained from pyelograms, but even these may be misleading. Tests of the function of each kidney separately may be of some aid in the diagnosis and in judging the function of the "healthy" kidney, Hillstrom states, but it is of subordinate value as an index of the state of the hydronephrotic kidney.

The prognosis depends largely on the amount of destruction of the renal tissue.

As regards treatment, nephrectomy is performed only because of extreme destruction of renal parenchyma, various other conservative procedures or combination of procedures being used in less severe cases. These include: (i) ligation and section of apparently obstructing vascular trunks, (ii) longitudinal incision at the uretero-pelvic junction with transverse closure, (iii) resections of portions of the dilated renal pelvis with or without nephrotomy, (iv) lysis of periureteral or peripelvic adhesions, (v) nephropexy, (vi) (advocated by Quinby) removal of the ureter to another position on the pelvis out of contact with the vessel and reimplantation of it in this position.

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The danger of ligation of a polar artery has been emphasized by Eisendrath,[17] also by Patch,[18] one of whose patients died a few months later from an intercurrent disease, the examination of the kidney showing necrosis of the segment supplied by the ligated vessel. The renal necrosis following ligation is, according to Patch, ordinarily aseptic, but secondary suppuration of the infarcted portion of the kidney may follow. Patch quotes the cases of Pousson and Eisendrath, in which secondary nephrectomy had to be performed.

Mathé[12] advises, if the artery is large and supplies as much as one-third or one-half of the kidney, one should not hesitate in sacrificing it, and quotes the work of Hinman, Hepler and others, who have shown that there is a complete absence of arterial anastomosis, either intrarenal or extrarenal. One can more readily sacrifice an aberrant vein, he states, because of the compensatory action of the collateral venous system.

Lee Brown, in the discussion on Quinby's paper,[9] also draws attention to the absence of anastomosis in the macroscopical branches of the renal artery; this does not apply to the renal veins, which anastomose everywhere. Every branch of the renal artery supplies a given area of renal parenchyma. When an aberrant branch is tied off, all the glomeruli associated with that particular branch will immediately be put out of action. There is no preglomerular anastomosis anywhere in the renal artery; yet it is possible to tie off aberrant vessels or smaller branches of the renal artery without getting complete necrosis of the area supplied. This is due, he states, to the capillary anastomosis in the efferent glomerular plexus. There will be an atrophy of that area with an atrophy of the glomeruli associated with that particular branch. If there is no gross infection of the kidney and the aberrant vessel is not too large, he thinks there need be no fear about tying off the vessel if it is causing definite obstruction in the ureter.

Clinical History.

Miss G.B., aged twenty, complained of pain in the right lumbar and right iliac regions at intervals varying from two weeks to two months during the past five years, always aggravated by exertion. The attacks of pain were not accompanied by vomiting and sometimes lasted only a few minutes, generally five to six hours, occasionally a whole day. For the past two months a dull dragging feeling had been noticed in the right subcostal region, occasionally interfering with sleep and necessitating rest in bed. The day previous to admission the pain gradually increased in severity and caused her to vomit twice on the morning of admission, and was also referred to the right lumbar region.

She had slight frequency of micturition for the past twenty-four hours. Her bowels had been regular and appetite good. Beyond an occasional cold, she had suffered no other illness or discomfort except her present pain, which had been diagnosed as appendicitis, kidney or gallbladder trouble by the various doctors she had consulted.

On examination, the patient was a thin, poorly nourished young woman with a large palpable cystic mass which moved on respiration and occupied the right upper abdominal quadrant. The urine was microscopically normal. Kline's test for syphilis gave no reaction. A pyelogram showed a normal left kidney, whilst the right ureter was completely obstructed at the right ureteropelvic junction. Excretion of four cubic centimetres of 0·4% indigo-carmine, given intravenously, commenced in five minutes from the left kidney.

The kidney was exposed by the transperitoneal route. At the lower pole a vein, about the size of the radial, was found in a small fold of fibrous tissue which crossed anterior to the uretero-pelvic junction and emptied into the inferior *vena cava*. The normal renal vessels were found coursing over the upper aspect of the distended pelvis and another independent smaller vein arose from the upper pole of the kidney on its posterior aspect, which was not followed to its termination. The kidney was removed, and on section the renal parenchyma was found markedly atrophied, in places being translucent and paper-like in consistence. Both abnormal vessels were sectioned and examined microscopically, and no accompanying artery was found.

The case is of interest on account of the rarity with which hydronephrosis is produced by an abnormal vein.

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Reviews.

STRUCTURE OF THE CENTRAL NERVOUS SYSTEM.

THE fact that "The Anatomy of the Nervous System," by Dr. Stephen W. Ranson, has reached a fourth edition is indicative of a successful publication.[1] The major part of the new matter consists "in the addition of a series of sections through the brain stem and basal ganglia, each accompanied by a key figure showing the plane in which the section was cut." The author rightly adds that "these figures and the brief descriptive text which accompanies them will not add to the burden placed upon the student, but will, on the contrary, very materially lighten it." Sixty-six pages are employed in this valuable presentation of large scale sections. The pages are so conveniently arranged that adjoining sections can be studied almost as if on the same page; by this means tracts can be easily traced from level to level. This admirable feature enormously simplifies the admittedly difficult task of apperceiving neurones in a tridimensional system.

Dr. Ranson has been prodigal in the use of illustrations throughout his text. They are excellently drawn and clearly annotated. Anyone interested in neurology would be tempted to buy the book for this reason alone.

[1] "The Anatomy of the Nervous System from the Standpoint of Development and Function," by S. W. Ranson, M.D., Ph.D.; Fourth Edition, 1931. Philadelphia: W. B. Saunders Company; Melbourne: James Little. Crown 4to., pp. 478 with 341 illustrations, some in colour. Price: 39s. net.

The opening chapters are devoted to a brief study of the comparative anatomy of the nervous system and its embryology in the human. A further chapter concerns the histology of the neurone. Subsequent divisions deal systematically with the spinal nerves, spinal cord, medulla and cerebrum. The nomenclature is simple, the tracts and centres are well described. The print is clear. The book can be recommended to any who wish for a moderate sized work of reference on the anatomy of the nervous system.

The concluding pages deal with a laboratory outline of neuro-anatomy and give hints on the dissection of the brain of the dogfish, pig and sheep.

As a practical commentary, the case histories of twelve patients showing organic lesions are briefly discussed. As the author indicates, they remind us of the clinical aspect. Quoting Henry Head, he remarks: "The charm of neurology, above all other branches of practical medicine, lies in the way it forces us into daily contact with principles."

Dr. Ranson is to be congratulated on the practical manner in which he has described the basic knowledge which underlies all true understanding of problems in neurology. The book contains an excellent bibliography.

THE HISTORY OF ANATOMY.

THE first edition of Dr. R. H. Hunter's "History of Anatomy" was reviewed in these columns some five years ago. The new edition has grown from a pamphlet of 51 pages to a book of 85 pages, and is divided into four chapters.[1]

To the student of anatomy the book offers a concise account of the gradual growth of the study of human anatomy from the "dawn" in ancient Egypt to the passing in England of *The Act for Regulating Schools of Anatomy* in 1832.

The history of anatomy has been strangely neglected by English writers. Only three histories have appeared in the last one hundred and fifty years. The earliest was "A Concise History of Anatomy," written by W. Northcote and published in London in 1782. This is a very scarce volume and had been sought for in vain for many years by such an indefatigable collector as Sir William Osler. The book itself is difficult to read and of little value as history.

In 1925 Dr. Charles Singer published his FitzPatrick Lectures with the title of "The Evolution of Anatomy," and this remains the most complete account of the history of anatomy which has been written up to the present time. Recently the third volume on the subject has been written by Professor Corner, of the University of Rochester, and published in a series of "Primers on the History of Medicine."

Dr. Hunter, in the new edition of his book, has expanded his previous work, giving a fuller account of the earlier anatomists and adding some interesting and gruesome stories of the activities of the "resurrection men." An interesting chapter is devoted to the history of the study of anatomy in England in which the author traces it from its introduction by Joannes Caius in the early years of the sixteenth century in the times of Edward VI and Elizabeth, through the discoveries of Harvey, to the work of the Hunters and Astley Cooper.

Dr. Hunter closes his book with a very apt quotation from an address by Barclay, the Scotch anatomist:

> Anatomy may be likened to a harvest field. First come the reapers who, entering on untrodden ground, cut down great stores of corn from all sides of them. These were the earliest anatomists of modern Europe, such as Vesalius, Fallopius, Malpighi and Harvey. Then come the gleaners, who gather up ears enough from the bare ridges to make a few loaves of bread. Such were the anatomists of last century—Winslow, Vicq d'Azyr, Camper, Hunter and the two Monros. Last of all come the geese, who still contrive to pick up a few grains scattered here and there among the stubble and waddle home in the evening, poor things, cackling with joy because of their success. Gentlemen, we are the geese.

This is a book which should be read by every medical student who is studying anatomy.

[1] "A Short History of Anatomy," by R. H. Hunter, Ph.D., M.D., M.Ch.; Second Edition, 1931. London: John Bale, Sons and Danielsson. Crown 8vo., pp. 85. Price: 3s. 6d. net.

BACTERIOLOGY.

PROFESSOR JORDAN'S "Text-Book of General Bacteriology" has reached its tenth edition.[1] There is evidence of careful revision and it has been entirely reset and reprinted.

To the medical reader not deeply versed in this subject, but anxious to obtain a broad outline of bacteriology presented in a readable form, this book must appeal strongly. It touches in brief outline also on those aspects of bacteriology applicable to agriculture, sanitation, the various industries, for example, tanning, baking, preservation of foodstuffs *et cetera*.

An exhaustive treatment of all aspects of bacteriology is neither attempted nor attained, and the advanced worker will not have his needs met in this publication. To those requiring a more detailed account of any particular subject there are references to the literature up to 1929.

It soon becomes evident that, with the exception of detailed descriptions of the methods of performing the Wassermann test and the Kahn precipitation test for syphilis, there is no attempt to give a detailed account of the various methods of laboratory procedure. There are many other excellent text books on this subject which, after all, can only be learned with the assistance of a skilled instructor. It is felt, however, that a little more stress might have been placed on the newer methods in diagnostic procedures, for example, the "O" and "H" variation applicable to the agglutination tests for the enteric fevers.

The considerable recent advances in bacteriology, for example, variation, undulant fever, paratyphoid fevers, filtrable viruses and anaerobes, have caused extensive revision in these chapters.

In the chapter on infectious diseases of unknown origin we note that there is no mention of the possible relationship of the avian tubercle bacillus to Hodgkin's disease.

Yeasts and moulds are dealt with attractively, but all too briefly. There is no slavish following of any particular system of nomenclature, but that portion of the newer terminology which has achieved general usage has been adopted.

This book can be recommended with confidence to all those who require an authoritative account in broad outline of this absorbing subject.

[1] "A Text-Book of General Bacteriology," by E. O. Jordan, Ph.D.; Tenth Edition; 1931. Philadelphia: W. B. Saunders; Melbourne and Christchurch: James Little. Royal 8vo., pp. 819, with illustrations. Price: 36s. net.

PSYCHIATRY FOR NURSES.

COMMENDABLE as the intentions of the author may be, the book entitled "Mental Nursing Simplified," by Dr. O. P. Napier Pearn, fails to attain the objects in view.[2] The unusual style and presentation do not make for easy reading. "Rhyme and reason" are often aids to memory, but the book lacks the latter and presents the former in its crudest form. The mnemonics seem harder to remember than the facts they represent. The diagrammatic representations are reminiscent of the action pictures of our prehistoric ancestors, and those intended to portray the instincts are ludicrous. The best chapters are perhaps those on the "Nervous System" and "Mental Disease and Disorder." Few alienists will feel disposed to recommend the book to members of their nursing staffs as an aid either to the understanding of the "Handbook for Mental Nurses" or to the passing of the mental nurses' examinations.

[2] "Mental Nursing (Simplified)," by O. P. Napier Pearn, M.R.C.S., L.R.C.P., D.P.M.; 1931. London: Baillière, Tindall and Cox. Foolscap 8vo., pp. 312, with illustrations. Price: 5s. net.

The Medical Journal of Australia

SATURDAY, DECEMBER 19, 1931.

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DEATH OF DR. ROBERT HENRY TODD.

ON Monday, December 14, 1931, Dr. Robert Henry Todd, the trusted and beloved friend of the medical profession in Australia, died suddenly. He had just returned from a trip to England and was looking forward with pleasure to his year of office as President of the New South Wales Branch of the British Medical Association in 1932. The warmth of the welcome extended to him at a recent meeting of the Branch bespoke the affection in which he was held.

"HYSTEROSALPINGOGRAPHY."

WHEN Rubin introduced his method of discovering whether the Fallopian tubes are patent, by passing carbonic acid gas through them, he gave to the medical profession a valuable means of examination. Since Rubin's work was first reported, the method has been improved, and lipiodol has been used for some time with considerable success in place of carbon dioxide. In Great Britain, Forsdike, of the Hospital for Women, Soho Square, London, has done much towards perfecting the method and showing how and when it can best be used. When any new method of treatment is brought forward it is seized upon by all sorts of people. The genuine workers test its value and report their findings; others, not to be outdone, pursuade themselves that the indications for its use should be extended; the knaves get hold of it and apply a clinical test which somehow or other gives the result they are looking for. Finally, the new method, which was admirably suited for certain definite conditions, becomes almost a panacea. With time, ardour cools, the enthusiastic become sceptical, the sceptics find that many claims for the remedy cannot be sustained and discard it altogether. It is only after many moons that they return to the original use for which the remedy was intended. Unfortunately, this sort of thing seems to be inevitable in medicine, and progress, more often than not, must be made by a roundabout road, a road of blighted hopes, false steps and cross purposes.

Rubin's method of examination has been raised in status; it has been dignified by the horrible name "hysterosalpingography."[1] Dr. S. A. Robins and Dr. A. A. Shapira, in reporting the results of their study of one thousand cases of "hysterosalpingography," throw down the gauntlet in their first sentence by making a dogmatic statement: "The diagnostic value of hysterotubography is just as important to the gynecologist as pyelography is to the urologist." In any discussion on this subject it must be clearly understood that the injection of lipiodol into the uterus and Fallopian tubes is a useful method of examination and, in certain circumstances, of treatment. What must be determined is whether there is not a growing tendency to use it when simpler methods would suffice. Presumably the report of Dr. Robins and Dr. Shapira may be taken as representing the extent to which radiography of the uterus and tubes is practised in some parts of America; their paper was read before the Section of Radiology and Physiotherapy of the annual meeting of the Massachusetts Medical Society. They have apparently been able to detect by this method almost every known gynæcological condition. Pathological conditions of the cervix

[1] S. A. Robins and A. A. Shapira: "The Value of Hysterosalpingography: A Study of 1,000 Cases," *The New England Journal of Medicine*, August 20, 1931.

include endocervicitis, polypi, relaxation or dilatation without pronounced endocervicitis, spasm, abnormally long cervical canals and cancer. The pathological conditions of the uterus ("all proven by operation") are quite numerous: hyperplasia or subinvolution, hyperplastic and tuberculous endometritis, polypi, submucous fibroids, leiomyomata, carcinoma, retained products of conception, blighted ovum, hydatidiform mole and pregnancy. The tubal conditions discussed include occlusion, extrauterine pregnancy, extrinsic tumours and sterility. One of the general conclusions of these authors is that by tubal radiography the size, shape and position of the uterus can be demonstrated. No doubt. Any final year medical student should be able to determine the size and position of the uterus by bimanual examination in ninety-nine cases out of a hundred. And there is such a thing as a uterine sound. No man in his right senses will use a steam crushing hammer to crack a walnut. The larger number of the conditions enumerated by the two Massachusetts authors can be diagnosed without injection of the uterus and subsequent radiography. We must therefore conclude that there is a tendency to carry too far the use of this method.

Radiography of the uterus and tubes after injection of lipiodol will be used most effectively in the diagnosis of sterility and in the treatment of so-called tubal spasm. But even in the investigation of sterility they will not always be required. With these indications most gynæcologists will not quarrel. That on rare occasions injection and radiography may reveal relevant facts discoverable by no other means is a further possible concession. After all, simplicity of diagnostic methods should be the aim of all medical practitioners. A gynæcological examination is distasteful to most women. They will not appreciate the mental stress and possible discomfort associated with an elaborate examination. Another important consideration from the patient's point of view is the question of cost. Very few medical practitioners will regard injection of uterus and tubes and radiological examination as part and parcel of the ordinary clinical investigation and make no extra charge. From the medical practitioner's point of view reliance on special tests and methods is to be deprecated. The ordinary methods of pelvic examination will nearly always suffice. If they are not sufficient and if there is a clear indication, more elaborate methods may be used. The man who makes his diagnosis by simple means, is much more expert than the man who flies at once to the elaborate and the spectacular.

Current Comment.

NEPHRITIS AND ŒDEMA.

MANY brave attempts have been made to classify the various forms of nephritis. Pathologists and physicians have vied with one another in the creation of classifications of increasing complexity. The cynic, surveying these imposing divisions and subdivisions, might be pardoned for the reflection that we know little or nothing of nephritis. Certainly no adequate definition of nephritis has yet been made. This is not surprising when it is remembered that our knowledge of the functions of healthy renal tissue is so imperfect. "If a little knowledge is dangerous," said Huxley, "where is the man who has so much as to be out of danger?" What was orthodox yesterday is heterodox tomorrow, and schisms grow apace.

The problem of nephritis is subservient to the problem of œdema. Could light be shed on the latter, the solution of the former would not be far off. "Behind the functions of the kidneys," said A. B. MacCallum, "is a history which links up the human body with the far past, when the first vertebrate members of our long ancestry lived in the brackish water of the sea, bathed in chlorides. The blood plasma, so far as its inorganic salts are concerned, is a reproduction of the remotely ancient ocean." This striking passage expresses the profound significance of the great tide of plasma and lymph in which the cells of the body are bathed. Even more pithily spoke the German physician: "We live in water—ay, but in a running water." When this water slackens in its perpetual flow, we have manifestations of œdema. But exactly how œdema is brought about and, having appeared, how it remains or clears are the problems which still await solution.

There are many forms of œdema of which we have cognizance, some more or less local, others universal in the body. There is the œdema of inflammation and of anaphylaxis; the œdema of malnutrition and of anæmia; and there is cardiac and hepatic and renal œdema. Henry A. Christian has recently discussed the causation of these various forms of œdema, with special reference to nephritis.[1] He points out that six factors are concerned in the mechanism, namely, filtration pressure, osmotic pressure, permeability of the vessel wall, salt con-

[1] *The Journal of the American Medical Association*, August 1, 1931.

tent of the tissues, lymphatic drainage from the tissues into the blood stream, and central nervous control of the blood flow. It is because all these factors may operate in greater or less degree in the mechanism of œdema that the subject acquires its disturbing complexity. Christian does not attempt to describe all components of the mechanism. He is concerned chiefly with the rôles of filtration pressure and osmotic pressure. He asks us to assume that in the central portion of a particular capillary the intravascular or filtration pressure is twenty-three millimetres of mercury. On the proximal side of this vessel, that is, towards the arteriole and larger artery, the pressure progressively rises, while on the distal side, towards the venule and larger vein, it progressively falls. We are further to assume that the osmotic pressure in the capillary is twenty-three millimetres of mercury. These are actual measurements recorded in a particular vessel. On these assumptions it is obvious that the filtration pressure is greater than the osmotic pressure on the arteriolar side and lower on the venous side, while in the centre of the capillary they balance exactly. As the effect of intravascular pressure is to drive fluid and dissolved electrolytes out of the vessel, while osmotic pressure attracts them into the vessel, it follows that in the centre of the capillary there will be no flow, while on the arteriolar side there will be a flux from the vessel, and on the venular side a flux into the vessel. When these external and internal flows balance, there is no accumulation of fluid and therefore no œdema. Should, however, changes either in osmotic or in filtration pressure take place in the capillary, œdema may result. For example, Epstein pointed out several years ago that in so-called chronic parenchymatous nephritis a great depletion of albumin from the blood plasma takes place, the normal proportions of albumin to globulin being reversed. Epstein blamed the continued loss of albumin through the kidneys for this fall in plasma protein. Since protein is the chief substance in the blood responsible for osmotic tension, the marked reduction of osmotic pressure which occurs in parenchymatous nephritis will cause an increased stream of fluid into the tissues on the proximal side of the arteriole and a diminished return to the vessel on the distal side, resulting in the clinical appearance of œdema. Again, in congestive cardiac failure the normally low pressure on the venous side of the capillary rises so that it may become almost but not quite positive. The effect of this is to retard the return of fluid to the vessel, causing œdema as in nephritis, but by a different mechanism, the one by a rise in filtration pressure, the other by a fall in osmotic tension.

How far these simple biophysical facts operate in the production of renal œdema is not known, and Christian makes little attempt to evaluate them. The other factors mentioned above play a part perhaps no less important than those of osmosis and intravascular tension. Thus the œdema of acute nephritis is hardly explicable by a fall in osmotic pressure of the blood. Christian believes that increased permeability of the vessel wall, caused possibly by damage to the endothelial wall by circulating toxins, is the chief factor here. But he maintains that the œdema of subacute and chronic nephritis is due chiefly to lowered osmotic pressure, variations in the electrolytic content of the tissue fluids playing a secondary part.

Coming now to the question of the classification of nephritis, Christian uses the presence or absence of œdema as a criterion. His classification is simple. It is as follows:

1. Acute nephritis.
   Subacute nephritis.
   - (*a*) Subacute nephritis with renal œdema; nephrosis.
   - (*b*) Hæmorrhagic nephritis.
2. Chronic nephritis.
   - (*a*) With renal œdema.
   - (*b*) Without renal œdema.

To these groups he adds two conditions, one, essential vascular hypertension progressing into chronic nephritis, the other, renal arteriosclerosis progressing into chronic nephritis. He maintains that there is no case of Bright's disease not included in this list, and that it allows clinical appearances to be correlated with pathological and ætiological facts. Thus, from the pathological point of view, glomerular lesions predominate in all the varieties of nephritis tabulated above, except in chronic nephritis without œdema, in which the lesion is chiefly a vascular nephritis associated with high blood pressure, cardiac failure and eventually œdema of the cardiac and not of the renal type ("the chronic interstitial nephritis of the older writers"). Essential vascular hypertension becomes identical with chronic nephritis without œdema when, as often happens, a renal lesion has developed. The same is true of renal arteriosclerosis. Ætiologically, all forms have a bacterial cause, except chronic nephritis without œdema, which appears to have a degenerative and not a bacterial origin.

Of course, Christian's classification has in its main features been familiar to physicians since he first wrote the section on nephritis in the "Oxford Medicine." The present article crystallizes the views expressed in that book. Like all classifications of nephritis, this one is imperfect by reason of the defects in our knowledge of renal function. But, unlike most, it has the rare virtue of simplicity and is yet not in conflict with known clinical and pathological data.

A CHRISTMAS APPEAL.

THE Council of the Medical Benevolent Association of New South Wales appeals to the members of the medical profession for additional financial support. The help that is given to beneficiaries suffices merely for a bare existence; at this season of the year it is felt that something more is called for. All contributions should be sent to Dr. E. S. Littlejohn, Honorary Treasurer, 135, Macquarie Street, Sydney.

Abstracts from Current Medical Literature.

MORBID ANATOMY.

X Ray Nephritis.

M. S. S. EARLAM AND A. BOLLIGER (*The Journal of Pathology and Bacteriology*, September, 1931) have continued their investigation on renal disease produced by X rays. In their previous work, by means of a dosage of about 3,800 *r*, they produced in dogs a renal lesion standardized histologically and functionally, and characterized by progressive and generalized cortical tubular degeneration. In their present work they have used half the previous dose of X rays. They find that the primary result of irradiation is an acute degenerative lesion of the convoluted tubules, followed by scarring and regeneration, the relative proportions of which depended on the amount of initial damage. The degree of histological change varied inversely with the weight of the animal, and in addition there was slight variation in individual dogs. Except in the smallest dogs, the irradiated kidney was capable by itself of supporting life through the period of maximum damage. The lesion was more gradual, less generalized and less standardized than that produced in the previous work. The authors state that, provided the opposite kidney be removed, various grades of renal disability can be produced, ranging from acute uræmic death to almost complete recovery; the severity of the lesion varies inversely with the body weight of the dog. X ray nephritis, when well established, is characterized by nitrogenous retention, acidosis, hypercholesterolæmia, polyuria, uræmia and a variable amount of œdema. The authors point out that, though the lesion does not exactly duplicate any clinical syndrome, it lends itself as a method for further research into the diagnostic, therapeutic or metabolic problems of nephritis.

Cancer of the Thymus.

O LEYTON, H. M. TURNBULL AND A. B. BRATTON (*The Journal of Pathology and Bacteriology*, September, 1931) have described two cases in which carcinoma of the thymus was apparently associated with pluriglandular disturbance. A boy, aged eleven, developed within one month fatness of the face, conspicuous hypertrichosis of the face and prominence of the abdomen. A man, aged thirty-one, developed during less than a year increasing fatness of the neck and trunk and *striæ atrophicæ* upon the abdomen. During the same period he suffered from night sweats, thirst and polyuria. Both patients on admission to hospital were found to be suffering from *diabetes mellitus*. In both instances autopsy revealed a small-celled medullary carcinoma of the thymus associated with hypertrophy of the cortex of the suprarenal bodies, functional hypertrophy of the thyreoid gland, infiltration of the medulla of the suprarenal bodies with lymphocytes and plasma cells, and fatty infiltration of the centres of the hepatic globules. The authors point out that Duguid and Kennedy have described glycosuria, enlargement of the suprarenal bodies and colloid goître in association with a small-celled medullary carcinoma of the thymus, in a woman aged sixty-four years.

Nerves in Tumours.

H. OERTEL, H. NYE AND B. TOMLINSON (*The Journal of Pathology and Bacteriology*, September, 1931) have continued the investigations of Oertel into the innervation of human tumours. Their observations confirm the conclusions previously expressed, that mature and immature human tumour tissues are innervated and that this innervation applies to blood vessels and also to the stroma and parenchyma of the growing tumour. In tumours, as in other tissue movements, the advance occurs as tissue entity, not in isolated parts.

Irritation and Cancer.

A. W. ERSKINE (*American Journal of Roentgenology*, September, 1931) argues that the evidence supporting the theory that irritation is a cause of cancer will not bear scientific investigation, since irritated areas do not become cancerous except in such numbers as may be accounted for by coincidence. Of all cancers of the lip 75% occur in smokers. However, 75% of all men of cancer age are smokers, and in half of these the lesion appears on the side opposite to which the cigarette or pipe has been habitually held. Most cancers of the cheek occur in mouths containing one or more rough teeth. About the same percentage of persons over fifty have rough teeth, if they have any at all. The incidence of gastric carcinoma is not increased in patients with ulcer, and carcinoma of the duodenum is extremely rare, while duodenal ulcer is very common. Cancer of the cervix often follows laceration, but its incidence is not greater proportionately in those who have borne children than in the childless. In patients with skin cancers on the face, showing that they were susceptible to the condition, it was practically never found on the part of the nose irritated by spectacles. Not only does cancer appear on unirritated areas, but it often does so in preference to developing on an adjacent irritated area. Many other examples are given, and the author contends that cancer developing on an irritated area can be explained by the laws of chance.

Carcinoma of the Thyreoid.

T. P. DUNHILL (*The British Journal of Surgery*, July, 1931) has continued his work on the thyreoid gland. He distinguishes three types of cancer of this gland: scirrhus, papilliferous adenocarcinoma and malignant adenoma. Scirrhus of the thyreoid does not differ from scirrhus occurring elsewhere in the body. In the thyreoid gland epithelial proliferation is the characteristic response to stimulation. The proliferation may resolve spontaneously or under treatment; it may form a benign tumour or it may form a tumour which invades the surrounding tissues and becomes disseminated. These stages merge into one another by insensible gradations. These gradations cause difficulty in deciding when a tumour has become malignant. Proliferation of thyreoid epithelium may be papilliferous or follicular in type. The former may result in papilliferous adenocarcinoma, the latter in malignant adenoma. The author suggests that the cause of carcinoma is stimulation; this stimulation may be normal and may affect tissue which is subefficient, or it may be so excessive as to be abnormal and amount to irritation.

Restoration of the Liver Following Partial Surgical Removal.

IT has been known for many years that rapid recovery follows either extensive chemical injury to the liver or partial surgical removal. G. M. Higgins and R. M. Anderson (*Archives of Pathology*, August, 1931) state that no statistical studies of the factors concerned have been made. They have carried out observations on white rats. Restoration began during the latter part of the first day following removal of 70% of the liver, and the preoperative ratio of weight of liver to weight of body was restored at from the tenth to the fourteenth day. Restoration was more rapid during the third and fourth days. Loss of body weight occurred after operation, recovery of body weight was not complete until after the twenty-fifth to the twenty-eighth day; hepatic restoration was looked on as complete at this time.

Tumours of the Bladder.

PAUL W. ASCHER (*Surgery, Gynecology and Obstetrics*, May, 1931) states that reliable information as to the nature of bladder tumours is obtained by cystoscopic biopsy in 97·5% of cases. The unavoidable failures occur chiefly in multiple tumours and in papillomatosis. Prognosis cannot be made from biopsy material alone in cases of malignant disease. A biopsy diagnosis of malignant disease in a case simulating papilloma by cystoscopy and response to fulguration is a signal for more radical treatment. Bladder tumours may be classified in the same way as other tumours. They are benign or malignant. Classification based upon cell grading alone is not satisfactory for clinical purposes, and prognosis on such basis does not, in the author's experience, coincide with the late results. The presence or absence of infiltration appears to be a more reliable guide to the gravity of the situation. The site of the malignant tumour determines its resectability, and this materially influences prognosis. Stalk invasion and tumour cells in the blood vessels at the base

cannot be detected by gross inspection. Although histological studies suggest that papillary carcinoma develops from papilloma in a considerable percentage of cases, evidence in support of this view is equivocal.

MORPHOLOGY.

"End-Arteries" of the Brain and Infarction.

S. COBB (*Archives of Neurology and Psychiatry*, February, 1931) gives an account of an investigation into the cerebral circulation and presents evidence to show that there are no end-arteries in the brain. He further states that relative lack of oxygen is all that is needed to start the train of events leading to an infarct and what is known as ischæmic or anæmic necrosis.

Automatic Associated Movements.

L. V. LYONS AND R. M. BRICKNER (*Archives of Neurology and Psychiatry*, May, 1931) draw attention to the existence of a group of automatic associated movements that are individually acquired and that can be contrasted with those that are phylogenetically grounded. The latter group is seriously impaired in Parkinson's syndrome, while the former may escape. Thus they have added evidence that both groups depend on some anatomic patterning. Therefore they hold that the rigidity alone cannot account for the impairment of movement in Parkinsonism and this again shows that the patterning of phylogenetic automatic associated movements is a striatal function. The patterning of the individually acquired movements is, presumably, a function of some part of the cortex.

Irradiation of the Ovaries of Guinea-Pigs.

IDA T. GENTHER (*American Journal of Anatomy*, May, 1931) states that there can be distinguished two important types of alteration in the function of the sexual organs following exposure of the ovaries to X rays. Long exposures with filtered rays always, and short exposures with unfiltered rays in 50% of cases, produced degeneration of large and small follicles, together with the egg-cells contained in their cavities, and subsequent hypertrophy of the *theca interna* cells of the follicles, so that the greater portion of the ovary became permeated with interstitial cells. New follicles continued to mature, partially or completely, but without any regularity. This was associated with irregularities in the œstrous cycle. In half the cases of short exposures with unfiltered X rays there occurred connective tissue atresia of all the follicles, except some of the primordial ones; later, a fibrosis of the ovary occurred, and the organ as a whole shrank. Sexual cycles were absent, and the genital tract was in a continuous resting condition. The author concludes that the generally accepted view as to the importance of the follicular hormone in initiating œstrus is correct, also that the *corpus luteum* is a regulator of the sexual cycle. It prevents ovulation and tends to counteract the effect of the follicular hormone. In its absence the cycle depends on the growth and function of the follicles only.

The Cells of the Suprarenal Cortex.

NORMAND HOERR (*American Journal of Anatomy*, May, 1931) describes the histology of the suprarenal cortex with regard to mitochondria, types of cells, dark and light, cell divisions and degenerations, and siderophilous substances. He also describes its reaction to chloroform narcosis and certain types of injury, for example, that due to diphtheria toxin, mustard gas, scorbutic diet, ligation of blood vessels *et cetera*. He concludes that the cells of the suprarenal cortex have a short life history. They are continually dying off in the *zona reticularis* and being replaced by cells produced by cell division in the outer part of the cortex, mainly at the border of the *glomerulosa* and fasciculate zones. The cells of the *zona reticularis* are so susceptible to disease because they are senescent or dying cells; they are of a highly differentiated type, are partially surrounded by capillaries and are poorly supported by connective tissue. They receive a large blood supply (six to seven cubic centimetres of blood per gramme per minute). They also receive a large quantity of the noxious agent. He was able to find no convincing evidence of a detoxicating function in the cortex.

Closure of the Foramen Ovale.

B. M. PATTEN (*American Journal of Anatomy*, May, 1931) states that the abandonment of the *foramen ovale* as an equalizing short cut between the right and left atria is not an abrupt, but a gradual process. At the close of embryonic life the pulmonary circulation is of sufficient volume to care for the oxygen intake and carbon-dioxide elimination, so that there is no necessity of assuming any revolutionary change in the course of blood through the heart at the instant of birth. Under the action of the functional activity of the lungs the pulmonary flow undergoes a smooth, steady increase during the first weeks of birth. The progressive diminution in the bore of the *ductus arteriosus* is concomitant and indicative of the post-natal increase in volume of the pulmonary circulation. As the pulmonary circulation increases there is a decrease in the compensatory flow through the *foramen ovale* from the right to the left atrium. The pulmonary return is about equivalent to the right atrial intake at about the end of the first post-natal month. The connective tissue of the valvula increases six or seven fold during the next six or eight months, but it is still possible to pass a probe through the foramen. The usual time of complete anatomical closure appears to be not earlier than the last third of the first year after birth, and is frequently much later. Incomplete adhesion with "probe patency" is so common that it must be regarded as a variant of the normal rather than as an abnormality. Examination of approximately 25% of all adult hearts reveals it in some degree.

The Neurofibrillar Structure of the Nerve Cell.

O. W. TIEGS (*Journal of Comparative Neurology*, February 15, 1931) gives an account of a study of neurofibrils. He believes they are not artefacts, but are structures which exist in the living cell. He suggests that they possess a conducting function, and maintains that neurofibrillar continuity from one neurone to another exists in certain instances.

The Forebrain of the Opossum.

Y. T. LOO (*Journal of Comparative Neurology*, February 15, 1931) completes the account of his investigations into the forebrain of the opossum. The complete investigation is a survey by methods of dissection, and by a study of serial sections prepared by the methods of Weigert, Nissl, Cajal and Golgi. The marsupial brain, while truly mammalian in form, is in many respects transitional from the reptilian type. Among the marsupials, the Virginian opossum occupies an intermediate position between the most primitive species and the highly differentiated forms like *Macropus*. It gives useful clues to an understanding of the ancestral type of cerebral organization from which the brain of the placental mammals has been evolved. In this generalized brain the arrangement of cell masses and fibre tracts is similar in principle to that of man, though with far less complication of details. The chief grey centres and fibre tracts, accordingly, are more sharply defined and their analysis is easier. This is in marked contrast to the texture of the brains of the most primitive vertebrates.

Transposition of the Ventricles and the Arterial Stems.

THOMAS WALMSLEY (*Journal of Anatomy*, July, 1931) describes a heart in which the aorta at its commencement lay in front of the pulmonary artery, and the two vessels ran straight upwards, maintaining their position without any spiral twisting on one another. Outside the pericardium the aortic arch passed backwards over the left pulmonary artery, and from its summit there arose a common stem for the right subclavian artery and the right and left common carotid arteries, and close to it, as a separate vessel, the left subclavian artery. The *ligamentum arteriosum* was impervious; and the left recurrent laryngeal nerve had its usual relations. There was no transposition of any of the viscera. The author identifies this rare condition as one named by Rokitansky "corrected transposition."

British Medical Association News.

MEDICO-POLITICAL.

ANNUAL MEETING OF THE DELEGATES OF THE AFFILIATED LOCAL ASSOCIATIONS OF MEMBERS WITH THE COUNCIL OF THE NEW SOUTH WALES BRANCH OF THE BRITISH MEDICAL ASSOCIATION.

THE annual meeting of the delegates of the Local Associations affiliated with the New South Wales Branch of the British Medical Association with the Council of the Branch was held at the British Medical Association House, 137, Macquarie Street, Sydney, on October 2, 1931, DR. GEORGE BELL, the President, in the chair.

The following delegates were present: Dr. A. W. Mobbs (Balmain District Medical Association), Dr. Kevin Byrne (Canterbury-Bankstown Medical Association), Dr. A. T. Roberts (Central Northern Medical Association), Dr. G. A. Buchanan (Central Southern Medical Association), Dr. K. S. M. Brown (Central Western Medical Association), Dr. A. M. Gledden (City Medical Association), Dr. Hugh Hunter (Eastern Suburbs Medical Association), Dr. W. F. Simmons (Illawarra Suburbs Medical Association), Dr. H. R. Scrivener (Kuring-gai District Medical Association), Dr. R. J. Jackson (Northern District Medical Association), Dr. R. V. V. Graham (North-Eastern Medical Association), Dr. L. Fetherston (South-Eastern Medical Association), Dr. P. J. Markell (South Sydney Medical Association), Dr. O. Robertson (Warringah District Medical Association), Dr. J. T. Paton (Western Medical Association), Dr. W. M. A. Fletcher (Western Suburbs Medical Association).

Baby Clinics.

Reference was made to a resolution adopted at the meeting of delegates in 1930, in which a protest was made against the behaviour of baby clinic nurses in visiting unsolicited the homes of nursing mothers and canvassing for patronage, and asking the Council to draw the attention of the Public Health Department to these facts with a view to correcting them. Dr. J. G. Hunter, the Medical Secretary, reported that he had interviewed Dr. E. S. Morris, Director of Maternal and Baby Welfare of the Department of Public Health, on this matter, and that Dr. Morris had stated that he would investigate any cases of which particulars were submitted to him by members. Dr. Hunter explained that up to the present no letters of complaint had been received from members.

Hospital Practice.

The question of hospital practice was raised and the assignment of a proportion of the contributions for treatment to the medical staff was discussed. It was moved by Dr. R. V. Graham and seconded by Dr. Kenneth Smith *pro forma*:

> That the hospital policy of the Central Council, British Medical Association, be adopted as the hospital policy of the New South Wales Branch in the following respect: That when any contribution to the cost of hospital treatment in a public hospital is made by, or on behalf of, any public ward patient from any source, a certain proportion of such contribution should be assigned to the medical staff in recognition of their services.

Dr. J. G. Hunter read Clause 32, Section 12 ("Recognition of Services of Visiting Medical Staffs") of the Hospital Policy of the Central Council. It was resolved by way of amendment, on the motion of Dr. R. B. Wade, seconded by Dr. A. W. Mobbs *pro forma*:

> That the policy of the New South Wales Branch, British Medical Association, should be that the medical profession, while agreeable now, as in the past, to assist in the public hospitals in the State by rendering gratuitous services to the indigent sick, claims that it should have the right to charge any patients in the public wards, and more particularly those patients whose hospital upkeep is paid for by some fund, for example, hospital contribution fund, and that such fund should be liable for the payment of medical fees as well as for other hospital services.

A discussion took place on the fees for treatment of intermediate patients, and it was resolved on the motion of Dr. R. V. Graham, seconded by Dr. K. S. M. Brown:

> That it be the policy of the New South Wales Branch that the matter of fees for treatment of intermediate patients in public hospitals be settled by arrangement between the patient and the attending practitioner.

Dr. J. G. Hunter explained the action taken by the Council in this matter.

Reference was made to the classification of patients under the *Public Hospitals Act*, 1929, and it was resolved, on the motion of Dr. R. J. Jackson, seconded by Dr. W. M. A. Fletcher:

> That the *Public Hospitals Act*, 1929, be amended to provide that in public hospitals where no intermediate wards are provided, patients who are contributors be classed as intermediate patients.

It was resolved, on the motion of Dr. R. V. Graham, seconded by Dr. Kenneth Smith:

> That the Council of the New South Wales Branch endeavour to have the *Public Hospitals Act*, 1929, amended by the deletion of Section 36 (1) and (2).

It was resolved, on the motion of Dr. R. V. Graham, seconded by Dr. A. W. Mobbs:

> That the Council of the New South Wales Branch endeavour to have the "Regulations" under the *Public Hospitals Act*, 1929, amended by the deletion therefrom of Regulation 31, and the alteration of Forms 4 and 5 under the Regulations, in order to place the practitioner on an equal footing with the hospital in the matter of recovery of fees due by patients.

Advertisements.

It was moved by Dr. R. V. Graham and seconded by Dr. R. J. Jackson:

> That the present By-Law 9 (*b*) of the New South Wales Branch is unnecessary and unduly restrictive and that steps be taken to secure its replacement by the previous By-Law 9 (*b*).

This motion, which had to do with the question of advertisements in newspapers, was discussed by several members. Dr. J. Hunter read some extracts from the British Medical Association "Handbook for Recently Qualified Medical Practitioners" in regard to advertising. The motion was put to the meeting and was defeated.

The Local Associations.

It was moved by Dr. R. V. Graham, seconded by Dr. W. F. Simmons:

> That the Articles of Association and By-Laws of the New South Wales Branch, British Medical Association, be amended in order to confer on the Local Associations the status and powers of Divisions of the Association.

The motion was discussed by several members, and after Dr. J. G. Hunter had defined "Divisions" of the British Medical Association, the motion was put and defeated.

An Australian Medical Association.

Dr. J. G. Hunter, in a circular letter to the Local Associations, had explained the action taken by the parent body in regard to the medical profession in Canada and South Africa.

It was noted that the Medical Association of South Africa (British Medical Association), with its Federal Council and Branches, was still part of the British Medical Association, whereas the Canadian Medical Association was a separate body affiliated with the British Medical Association in terms of the Articles of Association (Article 38) of the British Medical Association.

It was moved by Dr. K. S. M. Brown and seconded by Dr. H. R. Scrivener *pro forma*:

> That the time is ripe for the formation of an Australian Medical Association (on the lines of the South African Association and of the Canadian Medical Association), having complete autonomy and affiliated with the British Medical Association.

After discussion the motion was put to the meeting and lost.

The Government Savings Bank of New South Wales.

It was resolved, on the motion of Dr. Hugh Hunter, seconded by Dr. J. T. Paton:

> That in the event of the Government Savings Bank being opened for necessitous payments, the Commissioners should be approached with a view to having medical fees regarded as such.

Superannuation of Medical Practitioners.

It was resolved, on the motion of Dr. R. J. Jackson, seconded by Dr. H. R. Scrivener:

> That the Council be requested to formulate a superannuation scheme for members of the Branch.

Dr. J. G. Hunter explained during the discussion that the matter had been under the consideration of the British Medical Agency of New South Wales.

Workers' Compensation Practice.

The question of the liability of the employer for the cost of medical treatment of the injured worker in hospital was discussed. It was moved by Dr. J. T. Paton and seconded by Dr. A. W. Mobbs:

> That the Local Associations view with concern the delay in finalizing the test case by which a decision would be reached in the question of whether a medical man can receive payment for insurance cases treated in public hospitals.

Dr. J. G. Hunter explained the position and the motion was withdrawn.

It was resolved, on the motion of Dr. J. T. Paton, seconded by Dr. R. V. Graham:

> That the Local Associations protest against the fees paid by insurance companies for general practitioners' X ray work in cases under the *Workers' Compensation Act*.

NOMINATIONS AND ELECTIONS.

THE undermentioned have been elected members of the New South Wales Branch of the British Medical Association:

McCarthy, Charles Maurice, M.B., B.S., 1930 (Univ. Sydney), Copmanhurst, *viâ* Grafton.

Uther, Frederick Bryant, M.B., B.S., 1928 (Univ. Sydney), 8, Devonshire Street, Chatswood.

Research.

ANTHROPOLOGICAL EXPEDITION TO CENTRAL AUSTRALIA.

PROFESSOR J. BURTON CLELAND has forwarded the following report of an anthropological expedition to central Australia.

Most aspects of anthropology have a very distinct medical bearing. Especially is this the case with physical anthropology. The recent expedition undertaken by the Board of Anthropological Research of the University of Adelaide in conjunction with the South Australian Museum, in which much data on physical anthropology and physiological observations were obtained, is therefore of definite interest to medical practitioners.

During the last few years the University of Adelaide has organized a number of short expeditions to study the Australian native. Much of the expense has been borne by a fund provided by the Rockefeller Foundation and administered through the Australian National Research Council. The last of these was undertaken in August, 1931, the locality visited being Cockatoo Creek, two hundred miles by road north-west of Alice Springs. The party comprised Dr. T. D. Campbell (Organizer), Professor J. B. Cleland (Chairman of the Board of Anthropological Research), Professor T. Harvey Johnston, Professor C. S. Hicks and Professor H. J. Wilkinson, Dr. R. H. Pulleine, Dr. H. K. Fry and Dr. R. F. Matters, Mr. H. M. Hale (Director of the South Australian Museum), Mr. N. Tindale (Ethnologist to the South Australian Museum), Mr. H. Gray (student of medicine), and Mr. O. Stocker, as well as the assistant taxidermist from the Museum, Mr. A. Rau.

PART I: GENERAL REMARKS.

The locality chosen had been selected on the advice of Mr. F. Colson, of Alice Springs, and of Mr. Kramer, of the Aborigines' Friends Association. Mr. Kramer, in the interests of the aborigines, is accustomed to visit all parts of Central Australia, usually on camels, and as a result has an extensive knowledge of the native mind and has won the confidence of the natives themselves. There is no doubt that the Australian native requires everywhere some disinterested person who is in a position to look after his interests, and Mr. Kramer occupies such a position. Our experience has shown us that it is very necessary, in the interests of all concerned, that those natives who have not yet come in contact with civilization, should be prevented from doing so. They should be allocated extensive hunting grounds in their own country, and Europeans should be prohibited from trespassing on those grounds under any pretext. This concession we surely owe to those people from whom, by force and without any compensation whatsoever, we have taken away the land they possessed, and deprived them, in too many instances, of the means of obtaining food in their own way and even water. We are afraid that those natives who have come under European influence, whatever care is taken of them, are doomed to early extinction. They have mostly lost interest in their old native customs and live a half-starved existence on the outskirts of civilization. They are made use of to some extent by the white man, but the responsibility of treating them as what they are—that is, grown-up children—is not sufficiently often recognized, and from time to time they come under the influence of undesirable white persons and the women are only too often responsible for half-caste babies.

In advance of our reaching Cockatoo Creek, a considerable number of natives had been collected together by Mr. Kramer, and during our stay the total, comprising men, women and children, was nearly 150. Amongst them were those concerned only two or three years back in the killing of a white man and in attacks on others. Afterwards the police were responsible for the killing of a number of these natives. It might therefore have been thought that the relatives of these people would be suspicious of our possible intentions. The influence of Mr. Kramer had, however, overcome any such suspicions, if they existed, and on his good faith the folk came in from all directions to see us.

The area selected is nearly half way between Alice Springs and Tanami, and is situated thirty-five miles beyond any country as yet occupied by cattle or horses. The country consists of extensive plains covered with grass and mulga, or with grass and widely scattered small trees of beefwood, corkwood, bloodwood *et cetera*. Crossing these were wide sandy watercourses lined by red gums and other trees and shrubs. These streams only run occasionally and empty themselves over extensive flats. Rocky hills and even bold mountain bluffs and stony ranges break at intervals the flatness of the plains. Over this country roams the aborigine, obtaining a scanty supply of food by spearing emus and wallabies, by digging up roots and bulbs, by cutting witchetty grubs out of trees, by collecting wild honey, and by gathering grass

seeds, as well as by digging out rabbits and catching lizards. Water is scarce. To maintain an existence at all it is obviously necessary to spend most of every day in the search for food. Only occasionally can food be abundant.

These, then, were the conditions under which these people were living on our arrival. They looked, however, in good condition, though members of the expedition noticed that they became visibly fatter and more lively during our stay, due to the constant supply of food provided by us. Towards the end of our visit corroborees were a daily occurrence, and the natives were evidently feeling very fit.

The Children.

A noticeable feature of the native children is the distension of the abdomens. These were in nearly every case real "pot-bellies," at first suggesting the enlargements due to malarial spleens. The spleen was, however, not affected, and the distended abdomens were quite soft. As the native children, as well as the adults, spend a considerable amount of time in digging up the underground tubers of the nut grass (*Cyperus rotundus*) and eating these, it was thought that perhaps this food might be responsible, from its bulky nature, for the distended abdomens. Distension of the stomach with bulky food might give rise to the pot-bellied appearance or, on the other hand, food of a bulky but unnutritious nature might give rise to gaseous distension and perhaps disorders of nutrition, which might account for the distension. Boomerang legs were not uncommon amongst the natives, and here again possibly some nutritional imbalance may be the primary causative factor.

The bush fly (*Musca vetustissima*) was very numerous at Cockatoo Creek, but blowflies were absent, the latter probably the result of the prolonged drought killing off animals in whose carcasses they might have bred. These bush flies simply swarmed around the eyes of the natives, more particularly those of the children. Thus the eyes and mouth were often festooned with flies, the native children making practically no attempt to chase them away, and their little faces were also often repulsive from the dried discharges from running noses. Apart from such little defects, the children are most engaging little creatures. They are very kindly treated by their elders. A native mother would never think of refusing to give her baby a drink of breast milk if it cried. The children do not seem to be chastized when naughty. Their dispositions vary as much as do those of white children. One little chap got into a furious rage because his father had left him behind when he went to get his supply of food. He began crying piteously, and one member of the party tried to console him, but without effect. Later he was seen to throw himself on the ground in a paroxysm of rage, just as some spoilt white child might do under similar circumstances.

The boys, except the very small ones, associate with the men during the day time and indulge in various games when not occupied in searching for food, as, for instance, in digging up "yelka." Most of their games are directed towards practical purposes. Thus sheets of bark may be hurled at each other and dexterously avoided by the one aimed at, in preparation for the combats of adult life. A mimic battle took place between a group of small boys and some of the young men, the weapons being long firm stems of grasses gathered from the banks of the creek. These were cleverly thrown, and evidently at times the impact, from the appearance of the face, was not without some pain; the small boys of ten or twelve seemed to give as good as they got from the young men.

Disposition of the Natives.

The utmost friendliness existed between the natives and ourselves as soon as the first shyness had been overcome. There was not the slightest suspicion as to our intentions, and some of the processes and tests to which they were subjected might quite reasonably have raised some doubt. Thus, a needle was thrust into the lobe of the ear and blood collected, and among some races this might have suggested that blood was being taken for the purpose of gaining influence over the individual and of injuring him later. We have never met with the slightest objection in any part of South or Central Australia to our obtaining blood for blood-grouping. Then again, the apparatus necessary for ascertaining the basal metabolism is one which must have astonished unsophisticated minds, but not the slightest surprise or concern was manifested. The natives took as a matter of course the application of the clip to the nose and the breathing into a bag and the accompanying impressive paraphernalia. The taking of plaster casts necessitated the individual lying perfectly quietly for a considerable period of time whilst the plaster was applied to the face, as well as around the eyes and nostrils. No difficulty whatsoever was experienced. All these and many other similar requirements were submitted to without any protest as soon as the native understood what was desired of him. It is possible that white people in general, or ourselves in particular, were looked upon as being a very superior race. Consequently, if we said this or that was to be done, they probably believed that it was no good arguing or protesting in any way; the thing had to be done, and they submitted accordingly.

The patience of the natives is, of course, almost proverbial. Some of their examples of workmanship must have taken very many hours indeed to complete, and the manipulative skill employed must have meant a very long practical apprenticeship. Iron to some extent has filtered out to the wild tribes, so that they are much less dependent upon stone implements for fashioning "kulamans," spear-throwers, and weapons; hence these articles may be much more expeditiously made now than a generation back.

The sense of humour of the aboriginal is very similar to our own. They enjoy in a good-natured way the discomfiture of one of their fellows. They may simply roll from side to side with laughter, although still in a polite way, at the attempts of the European to pronounce one of their words. The "Laughing Song" was often put on the gramophone for their enjoyment, and they heartily joined in the merriment when they saw that we were doing so and that it was expected of them. On one occasion we tried its effect on a group of natives who had not heard it before. We kept perfectly solemn, and not a muscle moved on the faces of the natives. They recognized the fitness of things, and evidently this song was a ritual to be solemnly received. However, we put it on again, and this time joined in the laughter, and they soon unbent and seemed to find it infectious.

Sharing of Food.

Food is shared in communistic fashion. We saw a rabbit which had been brought into camp and which had been skinned and the inside removed, and then the edges of the abdominal wound had been brought together and transfixed with twigs. The carcass had been very imperfectly roasted in the fire. It had been given to, or belonged to, one of the old men, and he took the end of a boomerang and jabbed through the breast bone, thus exposing the body cavity; the half-raw blood and tissue juices contained in the body cavity it was his privilege to receive, and these were sucked up with considerable noise. He then proceeded with dismembering the rabbit and divided it into four pieces with the end of the boomerang. The other men were sitting in a circle; he passed three portions to men sitting in various parts of the circle, retaining one part himself; all then took a certain number of mouthfuls and then handed on the remainder of that portion of the rabbit to someone else in the circle, not necessarily his immediate neighbour. All those who had not yet received their bites remained sitting quietly without showing the least eagerness to receive the food, or any evidence of the slightest suspicion that someone else might get more than his share and that they might receive less. It seemed as though everyone knew approximately how much to take, so that the food passed round the whole group. When they are out hunting, the food is supposed to be brought back to camp; it may happen, however, that the game is too heavy to carry far, or some other excuse may present itself which justifies the hunters in making a fire and having a real good feast before they return with the rest of the game.

At stations in the southern parts, food given to native women, who may be helping in the housework, is carried

to the native camp and shared round, unless the mistress insists upon her domestics eating it before they leave the house. Even children show the disposition to share their food round. Quids of tobacco and *pituri* are similarly shared.

Moral Behaviour.

The impression we received was that a high code of morals existed amongst these natives, similar to that found by us to exist last year at MacDonald Downs, north-east of Alice Springs. Their code is, of course, not that of the white man, but there is no doubt at all that it is a high code and a code eminently suitable for them. The tribes concerned are divided into eight classes, and a man of one class is permitted to marry only a woman of a certain other class. This custom seemed to be maintained amongst the people who visited us at Cockatoo Creek, the various marriages being all "straight." Penalties are inflicted when a marriage is not "straight." The girl children are promised to their future husbands when quite young; they may be only seven or eight years old, or younger. When the girl reaches the age of maturity she is passed over to him and becomes his actual wife. In some cases, as, for instance, when left an orphan, the child may pass over to the camp of her future husband while she is still quite young. There she will be treated as a child, although considered technically as his wife until she reaches maturity. The old men have several wives, but quite young men have none. An old man of authority with, say, four wives, would have them of various ages, the youngest being perhaps in her teens. The children are promised to men of middle age or to old men, not to the young ones, the result being that the young women are the wives of old men and the young men have to be content with the cast-off old wives of their elders, or with widows older than themselves. This system has some decided advantages; when a man is getting old and not able to hunt or provide himself readily with food, or perhaps with his eyesight much impaired, as is so frequently the case, he has several wives whose duty it is to provide him with "tucker," and some of whom are quite young and active. On the other hand, a young man, a successful hunter, has to provide such meat food for his elderly wife.

During the day time the women keep by themselves, going out in companies digging roots and catching rabbits. The men keep quite apart, following their own occupations. A woman is not allowed to approach within about a chain of any man belonging to a class other than that into which she may marry. The result is that during the day time the woman must always keep at least that distance from a group of men. We found this a difficulty during our investigations at Cockatoo Creek. If the men were being measured and tested, the women had to be kept away, and *vice versa*. If occasionally one group of investigators in one part of the camp required members of one sex, and in another part the other sex were being tested, the members of each sex had to take a circuitous route in order to avoid coming into proximity with the other.

Under natural conditions the natives were without any clothing whatsoever, with the exception of a pubic tassel worn by the men. Near the borders of civilization it usually happens that a scanty amount of ragged clothing gets into the possession of the natives. In many cases they are required by station-holders to assume some covering when near the station. Moreover, the natives have come to regard some clothing as indicating the superiority of the clothed individual to the unclothed, and as being the right thing to do, if they have the clothing, when they are in contact with Europeans. The consequence was that most of the women at Cockatoo Creek had garments, often very ragged and scanty and dirty, but when these were donned there was assumed with them a becoming modesty. The native without anything on whatsoever was obviously utterly oblivious of being without any covering; but when a garment was assumed, however scanty, she was as unostentatiously modest as any European could be. Some amusing instances happened. One old lady was wanted in a hurry for some purpose and was called up from her camp. As she hurried along she seized the only article of attire that was handy, which consisted of an old hat, which constituted her whole attire. She felt that she was doing the right thing in assuming the attire in honour of the proximity of white people, and made the most of what was available.

The absence of clothing both by day and night means that the native has to keep himself warm during the cold weather by means of fire. With this he is exceedingly clever; fire is always carried from place to place, and as soon as there is the least feeling of chilliness a fire is lit—a small fire around which they congregate. At night time they lie with absolutely nothing on, surrounded by little fires, which have to be remade from time to time. The natives will not move about at night time without a fire-stick, whether it is required for the purpose of making a fire or not. It would seem as though a fire-stick afforded them some protection against the intangible evils abroad in the dark. They never travel by night.

The Rubbery Nature of the Soles of the Feet.

We had a kind of general impression that the soles of the feet of the natives were very hard and callous. On one occasion, when they had been dancing at a corroboree and during the process mulga splinters had entered the soles of the feet of some of the performers, at the end of the dance they sat down and took sharp-pointed sticks and began to dig out quite large pieces of wood from the undersides of their feet. As we were inspecting this process we were surprised to find that the soles were exactly like the rubber of an old solid tire. The sole of the foot was quite springy and soft, and somewhat porous-looking—just like an old tire—and into this rubber-like material the native dug perhaps a quarter of an inch deep to unearth the nearly buried splinters.

Blood-Letting.

Blood is of great value in preparing for various ceremonies, owing to its adhesive properties. One of the commonest sites from which to obtain it is the forearm, a ligature being applied above the elbow and a vein punctured longitudinally with a sharp stone point or a piece of glass. The blood flows in a continuous stream and is collected in a kulaman or a piece of hollowed bark. By rubbing the forearm and moving the muscle the flow may be increased when it begins to slacken. When blood is no longer required, a handful of dust is picked up and thrown over the wound. Another source of blood for ceremonial purposes is obtained by stabbing the underside of the subincised urethra.

PART II. BROAD DETAILS OF SPECIAL INFORMATION OBTAINED.

Each individual at Cockatoo Creek was given a number, and in many cases this was painted on the shoulder or buttock by means of white duco; also a cardboard number was tied round the neck or affixed to clothing, if worn. Mr. N. B. Tindale, Ethnologist to the South Australian Museum, allotted the numbers, obtaining at the same time routine personal, genealogical and tribal information regarding each of the ninety-one individuals specifically studied by the various sections of the expedition. He has furnished the following summary of his work and observations:

1. Cockatoo Creek (Aknatalya) proved to be near the boundary of the areas occupied by the Anmatjera (on the east) and by the Ilpirra (Walpari) tribe (on the west). These two peoples were represented by about equal numbers. A few individuals of the Kukatja (Luritja), Yumi, Ngalia and Walmala tribes, from the country south-west, west and north-west of Cockatoo Creek, were also encountered. An eight-class marriage organization is common to all these tribes.

2. Attention was paid to the recording of increase rites and ceremonies (*intitjiuma*) relating to the kangaroo, yam, white-plum and water totems. The written records were amplified by means of still and motion pictures and phonograph recordings. Some progress was made in determining the function of Ilpinga songs and ceremonies. The outstanding feature

of these is the singing of erotic songs by groups of young men in order to attract women. Temporary unions which may occur, conform to the rules of the class organization, that is, in the expressive native-English, they are said to be "straight." Their Ilpinga custom appears to be a result of the well marked and general difference in the relative ages of husband and wife or wives. Statistical data throw light on the results of the inter-age group marriages.

3. Observations were made on the methods and material employed by the Ilpirra people in making and using wooden shields, scoops and dishes, boomerangs, spears and javelins, spear-throwers, stone adzes, digging sticks and string ornaments. A series of two hundred ethnological objects was obtained.

4. Short vocabularies of some three hundred words of the Ilpirra and Anmatjera languages were recorded, statistical and geographical determinations being made on the phonetic variations observed in a few type words. A special attempt was made to ascertain the names of plants and animals of importance in the native economy, the plant determinations being made by Professor J. B. Cleland.

5. The absence of detailed maps of the country visited warranted the expenditure of some time in the making of physiographical and geological notes to serve as a link with details of the numerous native watering places, totemic centres and tribal boundaries. Marked ecological and geological differences, such as between the granitic ranges, the great red soil plains and the sand dune country, appeared to determine natural tribal boundaries. Owing to the great aridity of the climate in the winter months, the presence of "soaks" in the head waters of creeks, "pot holes" in granite outcrops and limestone springs in the great plains, determined the position of the principal camps. Alluvial fans, where temporary streams flood out and lose themselves, were proved to be of prime importance because of the abundant existing supplies of roots and bulbs to be obtained by digging.

6. Contact with Europeans. Motor transport, since 1928, has enabled several expeditions to traverse the Ilpirra and Walmala country. One prospector was killed by Walmala people and the consequent disturbances have tended to keep the two races apart. Metal tomahawks have been traded into the country, but only two metal-tipped adzes were noted; all others were of stone. The cutting implements on spear-throwers and the knives are exclusively of stone. One stone-axe factory was known in the Anmatjera country; the Ilpirra and western peoples claimed to have no axe-making places.

The individual was then passed on to Dr. Campbell and Mr. Gray, who made a series of measurements, on standard anthropological lines, on fifty-three adults, and also ascertained the exact tints of the skin and of the eyes, and the characters of the dentition, and recorded any abnormalities or pathological lesions. Samples of hair were also taken. The hair tracts were recorded of twenty-four children, and special nasal measurements and notes of other facial features were made on forty-nine adults. The spinal curvatures of thirty-four adults were taken and contrasted with the curvatures of the Europeans of the expedition. Foot outlines were obtained from twenty-five, and from the hands and feet of four. Records of palmar skin creases were taken of forty-nine individuals.

The subject next passed to be blood-grouped, work which was undertaken by Professor Cleland in conjunction with Professor T. Harvey Johnston. Ninety individuals were tested, of whom 26 belonged to Group O and 64 to Group A. In addition, a number of cross tests were done between native red cells and native sera; in all approximately 1,000 tests were made.

Dr. Pulleine and Dr. Fry carried out tests on the special senses and made various physiological observations. These included measurements of the strength of the grip, of the back and of the legs in 66 individuals, of pressure pain on 20, and of thermal pain on 10. Visual acuity was tested on ten subjects. By means of Stilling's tables 48 natives were tested for colour blindness, but no defect of this kind was found. Colour discrimination was tested by Holmgren's wools on 21 aborigines. Seven observations on auditory acuity were made. Attempts to discriminate warm surfaces at different temperatures failed to give decisive results. The acuity of the sense of smell was tested on seventeen persons. Taste was tested by means of sugar, salt and vinegar on five natives. Spatial perception was tested on nineteen. Nine were tested in discrimination of numbers. Several were given Porteus mazes to solve. Some records of native drawings with crayons on paper were obtained. Observations were made on the structure of the eye, nose and throat. Details of the methods of technique in manufacturing string, weapons and utensils were noted, as well as general observations on social life and emotional expression.

A large number of photographs were obtained, including standard ones of the numbered individuals, as well as scenes around the camp and incidents of camp life. In some cases special features of individuals, such as the eyes, the nose, boomerang legs *et cetera* were recorded. The total of these photographs amount to 273, and in addition various members of the party took a large number of snapshots. About 1,400 feet of cinema film of 35 millimetre width, and 2,400 feet of 16 millimetre film, 400 of the latter in colour, were obtained. These depicted corroborees, scenes around the camp, the method of obtaining food and making weapons *et cetera*. The work was entrusted to Professor H. J. Wilkinson and Mr. O. Stocker.

Plaster casts were made of seventeen faces and of the chests of three men and three women. Casts were also obtained of two boomerang legs, of the feet of two natives, of the hands of two, and of chest scars. This difficult procedure was in the hands of Mr. H. M. Hale, assisted by Mr. N. B. Tindale, of the South Australian Museum. Some dermatoglyphs were obtained by Professor Wilkinson.

Professor C. S. Hicks and Dr. R. F. Matters carried out tests on the basal metabolism of the natives. To do this it was necessary for them to get up at the first streak of dawn and to proceed to the native camp, where they woke the native sleeping naked by his small fire, and in the cold of the early morning placed a clip on his nose and got him to breathe into the apparatus. At the same time pulse rates and body temperatures *et cetera* were taken. Sometimes two or even three natives could be tested in a morning, but on one or two occasions, when it was near breakfast time, the results were inadvertently spoiled. A whistle used to blow summoning the natives to receive their "tucker." On one occasion the basal metabolism test was approaching completion when the whistle sounded; though the native himself did not stir, the sound of the whistle raised both his pulse rate and his basal metabolism, making it necessary to discard the results, much to the annoyance of the operators.

The basal metabolism of 42 individuals was estimated, four tests being made on each, together with measurements of pulse rate, respiration rate, blood pressure, the skin temperature and the mouth temperature. The temperatures and pulse rates revealed some interesting features; the mouth tmperature was found to be as low as under 35·6° C. (96° F.) in the cold of the early morning, and in some cases the pulse rate was only 45 per minute. It may be mentioned that on several occasions water froze during the night, and during the day the shade temperature rose sometimes as high as 32·2° C. (90° F.). Wet and dry bulb thermometer and kata-thermometer readings throughout the day completed the requirements for estimating the basal metabolism. By applying gum paper to the surface of the body, the surface area was ascertained of seven individuals. The rate of absorption of 0·9% sodium chloride solution by the subcutaneous tissues was ascertained on twenty-five individuals.

Such is a brief outline of the natives with whom this expedition had to deal and of the scope of the work undertaken. Probably on no previous occasion has so much work on physical anthropology been carried out on the Australian aborigine in so short a time. The results obtained have been exceptionally good, and it is hoped that means may be found to make further similar expeditions for some years to come.

Congress Notes.

THE AUSTRALASIAN MEDICAL CONGRESS (BRITISH MEDICAL ASSOCIATION).

THE Executive of the Fourth Session of the Australasian Medical Congress (British Medical Association) has made considerable progress in its arrangements. Nominations have been received from the several Australian States and from New Zealand for the positions of president and vice-president of the sections. Many of those nominated have accepted office; some gaps remain to be filled. It is hoped that a complete list will be published at an early date. The present indications are that a strong body of office-bearers will be appointed.

Members of the Branches who intend to contribute papers, are reminded that all papers must be in the hands of the Secretaries not later than six weeks before the date of Congress.

It is uncertain as yet what part the Government will be able to play in the entertainment of visitors, but individual members in Western Australia and the various sporting bodies assure the Executive that there will not be a lack of enjoyable entertainment. Day trips to surrounding places of interest and scenic beauty are being arranged and should a sufficient number of visitors desire to stay in Perth beyond the termination of Congress week, it is intended to arrange more extensive tours into outlying places of interest. These trips may be made by train or motor car, and it is probable that arrangements will be made for enjoyable trips by air to enable visitors to see as much of the country as possible.

Members of the Branches are reminded of the date of the Congress: The opening day is Monday, October 24, 1932, and the closing day Saturday, October 29.

Proceedings of the Australian Medical Boards.

QUEENSLAND.

THE undermentioned have been registered as duly qualified medical practitioners pursuant to the provisions of *The Medical Act of* 1925 of Queensland:

Barton, John a'Beckett Darvall, M.B., Ch.M., 1901 (Univ. Sydney).
Brown, Thomas Victor Stubbs, M.B., B.S., 1931 (Univ. Sydney), Brisbane.
Charlton, Robin Brett, M.B., B.S., 1931 (Univ. Melbourne), Brisbane.
Mayes, Bruce Tooma, M.B., B.S., 1927 (Univ. Sydney), Boonah.
Pye, Aubrey David Dick, M.B., Ch.M., 1925 (Univ. Sydney), F.R.C.S. (Edinburgh), Brisbane.
Rundle, Reeve Palmerston, M.B., B.S., 1917 (Univ. Melbourne), Hughenden.
Saxton, William John, M.B., B.S., 1924 (Univ. Melbourne), Brisbane.

Additional diploma registered:

Brandis, George Hayes, F.R.C.S. (England), 1931.

Obituary.

JAMES KAYE TROUP.

WE regret to announce the death of Dr. James Kaye Troup, which occurred on November 29, 1931, at North Melbourne, Victoria.

Public Health.

POLIOMYELITIS IN NEW SOUTH WALES.

THE following notice has been received from the Infantile Paralysis Committee of New South Wales:

The Infantile Paralysis Committee of New South Wales wishes to point out to medical practitioners that there has been a marked increase in the number of cases of poliomyelitis occurring in this State. During the past six weeks there have been about thirty cases in the metropolitan area, and several have been notified from country districts. In the majority there have been shown some or all of the following symptoms: Vomiting, anorexia, feverishness, retention of urine, irritability, twitching, headache, backache, stiffness of the neck or back, followed by paresis or paralysis of a limb. There have been some cases in which drowsiness amounting to stupor was the main feature.

If convalescent serum is to be effective, early diagnosis is essential.

Convalescent serum may be obtained for treatment in suitable cases by communicating with the Medical Officer of the Infantile Paralysis Committee, 135, Macquarie Street, Sydney (telephone B 1537), or with one of the following, who are in charge of serum for use in country districts: Dr. W. Trembath, Lismore; Dr. R. Rankine, Kempsey; Dr. E. Byrne, Newcastle; Dr. R. J. Jackson, Armidale; Dr. A. J. Park, Narrabri; Dr. K. Davis, Tamworth; Dr. S. Dawes, Orange; Dr. W. E. George, Broken Hill; Dr. G. A. Buchanan, Goulburn; Dr. H. O. Lethbridge, Narrandera; Dr. R. J. Solomon, Wagga.

POLIOMYELITIS COMMITTEE OF VICTORIA.

THE Poliomyelitis Committee of Victoria has forwarded the following notice:

The Committee controlling the campaign against poliomyelitis in Victoria has at its disposal a stock of convalescent serum for use in the preparalytic stage of the disease.

Owing to the difficulty of obtaining supplies and in order to gain further knowledge of the efficacy of the serum, the Committee is compelled to insist upon certain conditions governing the issue and use of the serum. These conditions are that it shall be administered only to cases in the preparalytic stage of the disease, in which the diagnosis has been confirmed by lumbar puncture and examination of the cerebro-spinal fluid, and that full particulars of the case are made available in due course to the medical officer of the Committee.

As regards the country districts of Victoria, the stocks of serum are held in charge of the medical practitioners whose names and addresses are given below and who are prepared and equipped to act as consultants and to carry out the necessary examination of the cerebro-spinal fluid.

Ballarat: Dr. Neville Wilson, Ballarat Hospital, Ballarat.
Colac: Dr. Doig, Colac.
Geelong: Dr. Hurley, Geelong Hospital, Geelong.
Hamilton: Dr. Houghton, Hamilton.
Maffra: Dr. Haydon, Kent Street, Maffra.
Mildura: Dr. Seeley, Mildura.
Moe: Dr. Harrington, Moe.
Mooroopna: The Medical Superintendent, Mooroopna Hospital, Mooroopna.
Swan Hill: Dr. F. E. Brown, Swan Hill.
Wangaratta: Dr. Godby, Wangaratta.
Warrnambool: Dr. Brauer, Warrnambool.
Yarram: Dr. Rutter, Yarram.

In Bendigo the stock of serum is held, by courtesy of the Commonwealth Health Department, at the Serum Laboratory, in charge of Dr. McIntosh, to whom application may be made should the serum be required.

It is to be noted that the Committee can take no responsibility for the fees of consultants and that in indigent

cases it will probably be best, where circumstances allow it, that the patient should be taken to the centre where the serum is held.

In the metropolitan area the Committee is anxious that serum should be made available to all consultants who are prepared to comply with the conditions mentioned above, and is prepared to supply serum as long as stocks are available.

When the serum is used for private patients who are not indigent, a charge at the rate of £1 for ten cubic centimetres will be levied against the consultant to whom it is issued.

All inquiries relating to the use of serum should be addressed to the Medical Officer of the Committee, Dr. Robert Southby, 164, Victoria Street, North Melbourne, N.1. Telephone F 1051.

Books Received.

BENDIEN'S DIAGNOSTIC METHODS FOR CANCER AND PRINCIPLES OF TREATMENT, by A. A. Miller, M.D., with an introduction by S. G. T. Bendien; 1931. London: H. K. Lewis. Crown 8vo., pp. 79 with one table and nine illustrations. Price: 3s. 6d. net.

A PRACTICE OF MEDICINE, by Adolph Strümpell; Thirtieth Edition, by E. Seyfarth, M.D., Ph.D.; translated by C. F. Marshall and C. M. Ottley; Volumes I, II and III, 1931. London: Baillière, Tindall and Cox. Crown 4to., pp. 2379, with 409 illustrations. Price: £5 5s. net.

MIDWIFERY, by Ten Teachers, under the Direction of Comyns Berkeley, M.A., M.D., M.C., F.R.C.P., F.R.C.S., F.C.O.G.; Edited by C. Berkeley, J. S. Fairbairn and C. White; Fourth Edition; 1931. London: Edward Arnold. Royal 8vo., pp. 751, with illustrations. Price: 18s. net.

AN INTRODUCTION TO HYGIENE, by W. Robertson, M.D., D.P.H., F.R.C.P.E.; 1931. Edinburgh: E. and S. Livingstone. Crown 8vo., pp. 207, with illustrations. Price: 6s. net.

HANDBOOK OF SKIN DISEASES, by F. Gardiner, M.D., B.Sc., F.R.C.S.E., F.P.S.E.; Third Edition; 1931. Edinburgh: E. and S. Livingstone. Crown 8vo., pp. 291, with illustrations. Price: 10s. 6d. net.

A SYSTEM OF BACTERIOLOGY IN RELATION TO MEDICINE: (Privy Council, Medical Research Council); Volume IX; 1931. London: His Majesty's Stationery Office. Crown 4to., pp. 364. Price: 21s. net.

PHYSICAL CHEMISTRY FOR STUDENTS OF MEDICINE, by A. Findlay; Second Edition; 1931. London: Longmans, Green and Company. Demy 8vo., pp. 272, with 46 figures. Price: 10s. 6d. net.

Medical Appointments.

Dr. L. V. Magee (B.M.A.) has been appointed Medical Officer, Medical Branch, Department of Public Instruction, New South Wales.

* * *

Dr. C. H. Prouse (B.M.A.) has been appointed Public Vaccinator, Werribee, Victoria.

Medical Appointments Vacant, etc.

FOR announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xviii.

ADELAIDE CHILDREN'S HOSPITAL, ADELAIDE, SOUTH AUSTRALIA: Resident Medical Officers (4).

BENEVOLENT SOCIETY OF NEW SOUTH WALES: Resident Medical Officer.

MATER MISERICORDIÆ CHILDREN'S HOSPITAL, BRISBANE, QUEENSLAND: Honorary Appointments.

PERTH HOSPITAL, PERTH, WESTERN AUSTRALIA: Junior Resident Medical Officers.

THE BRISBANE AND SOUTH COAST HOSPITALS BOARD, QUEENSLAND: Honorary Vacancies.

THE QUEEN'S (MATERNITY) HOME (INCORPORATED), ROSE PARK, SOUTH AUSTRALIA: Resident House Surgeon.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members desiring to accept appointment in ANY COUNTRY HOSPITAL are advised to submit a copy of their agreement to the Council before signing, in their own interests. Brisbane Associated Friendly Societies' Medical Institute. Mount Isa Mines. Toowoomba Associated Friendly Societies' Medical Institute.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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